

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>				1. CONTRACT ID CODE		PAGE OF PAGES 1      2	
2. AMENDMENT/MODIFICATION NO. 005		3. EFFECTIVE DATE 08/28/2014		4. REQUISITION/PURCHASE REQ. NO. PR-OSWER-14-00264		5. PROJECT NO. (If applicable)	
6. ISSUED BY CPD		CODE CPD		7. ADMINISTERED BY (If other than Item 6)		CODE	
CPD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268							
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)  BATTELLE MEMORIAL INSTITUTE 505 KING AVE COLUMBUS OH 432012693				(x) 9A. AMENDMENT OF SOLICITATION NO.			
				9B. DATED (SEE ITEM 11)			
				x 10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-11-038 0016			
				10B. DATED (SEE ITEM 13) 09/06/2013			
CODE (b)(4)		FACILITY CODE					
<b>11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS</b>							
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required) See Schedule							
<b>13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.</b>							
CHECK ONE		A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.					
		B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).					
		C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:					
X		D. OTHER (Specify type of modification and authority) FAR 52.243-2 Changes Clause-Cost-Reimbursement and T.O. 16, Modification 3					
E. IMPORTANT: Contractor <input checked="" type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)							
Tax ID Number: (b)(4)							
DUNS Number:							
The purposes of this modification are to: revise the Base Period end date from September 30, 2014 to August 31, 2014; and exercise the Optional 1-year task order extension with a performance period of September 1, 2014 through September 4, 2015. The contractor shall provide revised costs for Tasks 5 and 6 of the Optional Period. Funding for the optional period will be added to the Task Order after the revised costs have been approved. TOPO: Ryan Haerer LIST OF CHANGES: Reason for Modification : Exercise 1-year Option Period							
Continued ...							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Camille W. Davis			
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		16C. DATE SIGNED		16D. DATE SIGNED	
(Signature of person authorized to sign)				Camille W. Davis		08/28/2014	
				ELECTRONIC SIGNATURE			

## CONTINUATION SHEET

REFERENCE NO. OF DOCUMENT BEING CONTINUED

EP-C-11-038/0016/005

PAGE OF

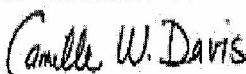
2

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NAME OF OFFEROR OR CONTRACTOR

BATTELLE MEMORIAL INSTITUTE

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	<p>Base Period End Date changed From: September 30, 2014 To: August 31, 2014</p> <p>The Optional Period of Performance is hereby established:</p> <p>From September 1, 2014 through September 4, 2015</p> <p>Delivery Location Code: R3 Region 3 US Environmental Protection Agency 1650 Arch Street Philadelphia PA 19103-2029 USA</p> <p>Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center (D143-02) 109 TW Alexander Drive Durham NC 27711</p> <p>FOB: Destination Period of Performance: 09/06/2013 to 09/04/2015</p>				

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>			1. CONTRACT ID CODE		PAGE OF PAGES 1      2												
2. AMENDMENT/MODIFICATION NO. 004		3. EFFECTIVE DATE See Block 16C		4. REQUISITION/PURCHASE REQ. NO. PR-OSWER-14-00264		5. PROJECT NO. (If applicable)											
6. ISSUED BY CPD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268		7. ADMINISTERED BY (If other than Item 6) CODE															
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)  BATTELLE MEMORIAL INSTITUTE 505 KING AVE COLUMBUS OH 432012693				9A. AMENDMENT OF SOLICITATION NO.													
				9B. DATED (SEE ITEM 11)													
				10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-11-038 0016													
				10B. DATED (SEE ITEM 13) 09/06/2013													
CODE (b)(4)		FACILITY CODE															
<b>11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS</b>																	
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12. ACCOUNTING AND APPROPRIATION DATA (If required) See Schedule				Net Increase:		\$6,115.00											
<b>13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.</b>																	
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:10%;">CHECK ONE</td> <td>A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.</td> </tr> <tr> <td></td> <td>B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).</td> </tr> <tr> <td></td> <td>C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:</td> </tr> <tr> <td></td> <td>D. OTHER (Specify type of modification and authority)</td> </tr> <tr> <td style="text-align: center;">X</td> <td>Limitation of Funds Notice</td> </tr> </table>								CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.		B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).		C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:		D. OTHER (Specify type of modification and authority)	X	Limitation of Funds Notice
CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.																
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	D. OTHER (Specify type of modification and authority)																
X	Limitation of Funds Notice																
<b>E. IMPORTANT:</b> Contractor <input checked="" type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.																	
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)																	
Tax ID Number: (b)(4)																	
DUNS Number: _____																	
The purpose of this modification is to add funding to fully fund the task order.																	
TOPO: Ryan Haerer																	
LIST OF CHANGES:																	
Reason for Modification : Funding Only Action																	
Obligated Amount for this Modification: \$6,115.00																	
Incremental Funded Amount changed																	
Continued ...																	
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.																	
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)													
				Camille W. Davis													
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		16C. DATE SIGNED													
(Signature of person authorized to sign)				 <b>ELECTRONIC SIGNATURE</b>		07/01/2014											

<b>CONTINUATION SHEET</b>	REFERENCE NO. OF DOCUMENT BEING CONTINUED EP-C-11-038/0016/004	PAGE OF 2 2
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NAME OF OFFEROR OR CONTRACTOR  
BATTELLE MEMORIAL INSTITUTE

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	<p>From: \$125,782.00 To: \$131,897.00</p> <p>CHANGES FOR ACCOUNTING CODE: 12-13-B-03P00SP-302D86-2532-1303PK1006-001 Account code changed from 12-13-B-03P00SP-302D86-2532---1303PK1006-001 to 12-13-B-03P00SP-302D86-2532-1303PK1006-001</p> <p>NEW ACCOUNTING CODE ADDED: Account code: 14-15-B-88F-302D86-2505-1488TS5001-001 Beginning Fiscal Year 14 Ending Fiscal Year 15 Fund (Appropriation) B Budget Organization 88F Program (PRC) 302D86 Budget (BOC) 2505 Job # (Site/Project) Cost Organization DCN-LineID 1488TS5001-001 Amount: \$6,115.00</p> <p>Cost: \$(b)(4) Fee: Total: \$6,115.00 Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center (D143-02) 109 TW Alexander Drive Durham NC 27711 FOB: Destination Period of Performance: 09/14/2011 to 08/31/2016</p>				

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>			1. CONTRACT ID CODE		PAGE OF PAGES 1 10		
2. AMENDMENT/MODIFICATION NO. 003		3. EFFECTIVE DATE 05/09/2014		4. REQUISITION/PURCHASE REQ. NO. PR-R3-13-00311		5. PROJECT NO. (If applicable)	
6. ISSUED BY CPOD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268		7. ADMINISTERED BY (If other than Item 6) CPOD		7. ADMINISTERED BY (If other than Item 6)		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) BATTELLE MEMORIAL INSTITUTE 505 KING AVE COLUMBUS OH 432012693				(x) 9A. AMENDMENT OF SOLICITATION NO.		9B. DATED (SEE ITEM 11)	
CODE (b)(4) FACILITY CODE				X 10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-11-038 0016 10B. DATED (SEE ITEM 13) 09/06/2013			

**11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS**

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

**12. ACCOUNTING AND APPROPRIATION DATA (If required)**

See Schedule

**13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.**

CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	D. OTHER (Specify type of modification and authority) Mutual Agreement between the parties and Battelle's proposal dated May 2, 2014

**E. IMPORTANT:** Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

**14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)**

Tax ID Number: (b)(4)

DUNS Number:

The purposes of this modification are to: revise the Task Order PWS and revise the Task Order cost and fee ceilings. Please note that at this time, EPA accepts Battelle's technical proposal for Tasks 5 and 6 and may award Tasks 5 and 6 under a separate task order at a later date. Funding for these revisions will be added at a later date.

TOPO: Ryan Haerer

LIST OF CHANGES:

Reason for Modification : Task Order PWS Revisions

Continued ...

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Camille W. Davis	
15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign)	15C. DATE SIGNED	11 Camille W. Davis	16C. DATE SIGNED 05/09/2014

**CONTINUATION SHEET**

REFERENCE NO. OF DOCUMENT BEING CONTINUED  
EP-C-11-038/0016/003

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2 10

NAME OF OFFEROR OR CONTRACTOR  
BATTELLE MEMORIAL INSTITUTE

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	<p>Total Amount for this Modification: \$6,115.00</p> <p>CHANGES FOR LINE ITEM NUMBER: 1</p> <p>Total Task Order Amount changed From: \$125,782.00 To: \$131,897.00</p> <p>The revised Task Order Break-out and Total are as follows:</p> <p>Cost: (b)(4) Fee: \$ Total: \$131,897.00</p> <p>Delivery Location Code: R3 Region 3 US Environmental Protection Agency 1650 Arch Street Philadelphia PA 19103-2029 USA</p> <p>Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center (D143-02) 109 TW Alexander Drive Durham NC 27711</p> <p>FOB: Destination Period of Performance: 09/14/2011 to 08/31/2016</p>				

**PERFORMANCE WORK STATEMENT**  
**STREAMS II**  
**Task Order 0016, Battelle EP-C-11-038**  
**Modification 3**

**TITLE:** Failure Analyses of Underground Storage Tank Equipment in Biofuels Service II

<b>Task Order Manager (TOM)</b> <b>Name:</b> Ryan Haerer <b>Office:</b> U.S. EPA OSWER/OUST 1200 Pennsylvania Avenue, NW Washington, DC 20460 <b>Phone:</b> (703) 347-0151 <b>Email:</b> <a href="mailto:Haerer.Ryan@epa.gov">Haerer.Ryan@epa.gov</a>	<b>Alternate Task Order Manager (ATOM)</b> <b>Name:</b> Andrea Barbery <b>Office:</b> U.S. EPA - Headquarters OSWER/OUST/RPD (MC-5402P) 1200 Pennsylvania Avenue, NW Washington, DC 20460 <b>Phone:</b> (703) 603-7137 <b>Email:</b> <a href="mailto:Barbery.Andrea@epa.gov">Barbery.Andrea@epa.gov</a>
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**PERIOD OF PERFORMANCE:** September 6, 2013 through September 30, 2014.  
A 1-year Task Order extension may be performed at a later date.

Up to 45 exploratory pre-investigations and chemical analyses of samples collected at those sites may be performed during the period of performance.

**BACKGROUND**

Biofuels will provide a greater contribution to the fuel supply in the United States because of the Renewable Fuel Standard established by the Energy Policy Act of 2005 and amended by the Energy Independence and Security Act of 2007. These federal mandates have spurred a significant increase in biofuel production as well as an increase in the number of retail facilities storing and dispensing renewable fuels such as ethanol and biodiesel. Introduction of biofuels to underground storage tank (UST) systems has created concerns about how these fuels react with the materials found in UST systems. 40 Code of Federal Regulations 280.32 requires that owners and operators use an UST system made of or lined with materials that are compatible with the substance stored in those UST systems.

Due to concerns over compatibility of biofuel blends with UST equipment, in June 2011, EPA issued guidance on compatibility of UST systems with biofuel blends. This document, "Compatibility of Underground Storage Tank Systems with Biofuel Blends," provides options for UST owners and operators to use in complying with the federal compatibility requirement for UST systems containing greater than 10% ethanol or diesel containing greater than 20% biodiesel. In that guidance, EPA lists the following UST system components to be critical for demonstrating compatibility:

- Tank or internal tank lining
- Piping
- Line leak detector
- Flexible connectors
- Drop tube
- Spill and overfill prevention equipment
- Submersible turbine pump and components
- Sealants (including pipe dope and thread sealant), fittings, gaskets, o-rings, bushings, couplings, and boots
- Containment sumps (including submersible turbine sumps and under dispenser containment)
- Release detection floats, sensors, and probes
- Fill and riser caps
- Product shear valve

These components are likely to be in direct contact with fuel, and if incompatible with the fuel, may lead to a release to the environment. For more background information regarding the compatibility of UST system components with biofuel blends, please see EPA's guidance at: <http://www.epa.gov/oust/altfuels/biofuelsguidance.htm> .

Recent tank failures involving tanks containing ethanol or biodiesel have come to the attention of EPA. EPA is also hearing reports of severe and rapid corrosion cases happening nationwide in large numbers of tanks storing Ultra Low Sulfur Diesel. Field reports suggest that line leak detectors in these tanks may be malfunctioning and failing annual safety testing at much higher rates than prior to these severe and rapid corrosion incidents being reported beginning around 2007. This timeframe correlates with the rapid increase of ethanol and biodiesel blending into the fuel supply with the enactment of the Renewable Fuel Standard. The only previous research study into this corrosion that EPA is aware of was a small-scale research study of six tanks experiencing this corrosion. The results of the study suggested the corrosion is likely due to ethanol or biodiesel that has contaminated the ULSD fuel supply.

In prior efforts to address the compatibility challenges with biofuels being stored in USTs, EPA looked for case studies of failed tanks storing biofuels and performed an extensive case study of one such site to try to look back and determine exactly the cause of failure and the role that biofuels played in that failure. However, drawing conclusive results or usable information for further research from analysis of a tank that had already failed was very difficult because the internal chemical and biological conditions sampled after the site was selected and research planned were very different than the internal tank conditions that existed prior to the failure. Drawing conclusive results on biofuels' possible role in the failure during the course of the in-depth case study proved difficult and drawing actionable information that could lead to changes in safety for storing biofuels was not possible. EPA believes that a better understanding of the

internal chemical conditions of "live" (functioning) tanks that may lead to these corrosion incidents prior to possible equipment failure can help EPA pinpoint the cause of the corrosion and help prevent future equipment failure and possible releases to the environment from UST systems and reduce the pollution to ground water.

EPA therefore plans to forego the three (3) remaining case analyses of failed tanks in order to collect and sample conditions of a larger number of tanks within the allowable pre-investigations plan (Task 2). EPA plans to collect fuel, water and vapor samples at live tanks currently experiencing the corrosion incidents ("dirty" sites) and at tanks that are not experiencing the corrosion ("clean" sites) in order to analyze them and compare the results to understand the chemical conditions that correlate with corrosion. This will help EPA determine the role that biofuels are playing in widespread equipment failure.

### **Locations**

Exact site locations are to be determined from functioning tank sites currently available to us from federal and private partners. Upon identification of appropriate sites, EPA will contact the contractor and provide contact information for the tank owners or other individuals having knowledge of the facility. Exploratory pre-investigations will be performed at these sites to visually inspect the inside of the tank with a camera to determine if the site is actually "clean" or "dirty" and to collect fuel, water, and vapor samples at each site. The contractor will coordinate shipping of samples collected at the site to its laboratory for analyses.

### **Purpose**

EPA is interested in studying UST incidents where components may fail because of possible material incompatibility with biofuels or biofuels contamination or other yet-to-be-determined circumstances. The contractor shall provide field support to EPA including: collection and documentation of information relevant to the site, equipment, or any history of known equipment failure; preparation of sampling kits and sampling instructions to the site; and analyses of samples shipped from the site. The contractor shall assist EPA by conducting forensic analyses of pertinent UST fuel, water and vapor samples collected during the course of UST pre-investigations. Specifically, the purpose of this investigation is to use methods of forensic investigation to determine the structural, mechanical, or chemical conditions that may lead to failure for UST components because of incompatibility with biofuels or some other yet to be determined circumstances.

### **TASKS**

#### **TASK 1: Project-Specific QUALITY ASSURANCE PROJECT PLAN (QAPP)**

Once EPA chooses UST sites appropriate for the pre-investigations, the EPA Contracting Officer Representative will provide more specific information to the contractor. The contractor will then

have five (5) days to deliver to EPA a project-specific QAPP, using elements described in the general QAPP which was approved by EPA (Attachment 1).

Task 1 Deliverables:

1. A project-specific QAPP, once appropriate sites have been identified. The project-specific QAPP must be delivered for EPA review and approval at least five (5) days prior to the collection of samples or, at a date specified by the EPA TOM.

Task 1 Acceptance Criteria:

1. List of standards and/or protocols is adequate;
2. The shipping plan is adequate and meets DOT requirements for shipping hazardous materials.
3. Project-specific QAPP clearly identifies what information will be sought, and what analysis will be performed in order to determine the tank conditions that may be leading to severe corrosion and equipment failure.
4. The project-specific QAPP clearly states the standard criteria and method to be used to label a tank as corroded or non-corroded for the purposes of the research investigations.

## **TASK 2: EXPLORATORY PRE-INVESTIGATIONS**

Once EPA decides on UST sites appropriate for pre-investigations, the EPA Contracting Officer Representative will provide more specific information to the contractor. The contractor will coordinate pre-investigations of up to 45 sites to aid EPA in gathering data to analyze to determine the conditions likely to contribute to potential equipment failure.

The pre-investigation activities include:

1. a visualization of the in-tank circumstances using a video recorder to determine if corrosion is present on more than five percent of the Submersible Turbine Pump shaft
2. gaining clarification and/or more details to the site circumstances (i.e., automatic tank gauging records, maintenance records, biocide use and general information), and
3. depending on whether fuel is available for sampling, the technician will also collect the necessary liquid and vapor samples from the fuel, water bottoms, and vapor spaces and ship them to the contractor's laboratory.
4. The samples will be stored appropriately for chemical analyses and possible biological analyses. These samples will be analyzed according to the site-specific QAPP.

Once the visual data is collected on site, it will be combined with the initial information reported by the site owner/operator into a database tracking which pre-investigation sites are corroded or non-corroded that will later be combined with the results of the chemical analysis of the samples.

#### Task 2 Deliverables:

1. A pre-investigation database that contains the results of the 45 pre-investigations, categorizing each site by tank construction material and as corroded or non-corroded and accompanies the in tank video DVDs

#### Task 2 Acceptable Criteria:

1. Pre-investigation database summarizes the findings that address the items numbered above;
2. The in-tank video DVD is in good quality
3. When necessary using selective images from the DVD to support the recommendation to aid EPA in making decision about naming the site for in-depth failure analyses.

*The previous Task 2, Site Specific Quality Assurance Project Plan (QAPP) is hereby deleted in its entirety.*

### **TASK 3: INFORMATION GATHERING**

Upon identification of a site to be used for pre-investigation, EPA will contact the contractor and provide contact information for the tank owner and/or other individuals having knowledge of the facility and of any possible equipment failure. The contractor will work with knowledgeable individuals to obtain the following information:

1. Tank and piping information including tank type and age, volume of tank, dimension of the tank;
2. Information on any repairs or upgrade made to the UST system prior to investigation;
3. Fuel stored, including octane and biofuel content, and the height of tank when pre-investigation occurred;
4. Bill of lading or drop ticket from the date of the last fuel delivery, any typical monthly throughput, and if available, release detection records for the past 12 months prior to the and inventory control records for the past 12 months prior to the investigation;
5. Past failed UST components, including manufacture and date of installation;
6. Failure mode, and other relevant details about the equipment;
7. Whether any product was released to the environment in association with the equipment failure;
8. Any available photographs showing failed components of the UST system that were taken by the tank owner, UST service provider, state or local emergency responder, or other individual knowledgeable of the facility and equipment failure;
9. Any other information relevant to the site, equipment, or past failure mode.

#### Task 3 Deliverables:

1. Summary of findings, as part of the database, that address the items numbered above;
2. List of people contacted (if they are willing to be named), provided in an appendix to the forensic report;
3. Photographs shot at the UST facility where the any component failure took place;
4. Data on tank dimension, documentation of repairs and upgrades made to the UST system, bills of lading or drop tickets, release detection records, inventory control records (if available).

#### Task 3 Acceptance Criteria:

1. Reasonable effort made to collect the above information and justification for not obtaining data;
2. Summary of information collected is clear, concise, and presented in an understandable way;
3. Documents, maps, data or photographs provided as specified in the deliverables for possible future use in a report.

### **TASK 4: OBTAINING SAMPLES**

The contractor will provide instructions to the site preparing for the pre-investigation. The contractor may use ASTM E2733, "Standard Guide for Investigation of Equipment Problems and Releases for Petroleum Underground Storage Tank Systems," or an equivalent SOP for investigation of equipment problems, including documentation of findings and sample preparation. The contractor will ship samples and meet DOT requirements for shipping hazardous materials. Overall, the contractor will also coordinate the shipping to its laboratory of any UST components suspected of failure due to incompatibility or other yet-to-be-determined causes if available and agreed upon with EPA. EPA will inform the contractor when the failed UST equipment becomes available, and will provide that information to the contractor for preparing the instructions for sample collection.

#### Task 4 Deliverables:

1. List of standards and/or protocols used for sample collection and shipping.
2. Shipping plan for the categories of samples listed in ASTM E2733.

#### Task 4 Acceptance Criteria:

1. List of standards and/or protocols is accurate and complete;
2. Evidence showing the shipping plan is being followed.

**MAY COMPLETE THIS UNDER A NEW TASK ORDER AT A LATER TIME**

**TASK 5: SAMPLE ANALYSES**

The contractor shall analyze the samples shipped from the pre-investigations using internationally-recognized sampling and testing protocols, in order to determine the conditions that may correlate with corrosion observations and be the possible root cause of equipment failure.

**Task 5 Deliverables:**

1. List of standards and/or protocols used for sample analysis, provided in the appendix to the forensic report (can be combined with the deliverable from Task 3);
2. Test data, tables, charts, and/or graphs, provided in an appendix to the forensic report (laboratory deliverables shall contain all information listed in Attachments 1 or 2, as applicable to the type of analyses requested (i.e., organic or inorganic)).

**Task 5 Acceptance Criteria:**

1. List of standards and/or protocols is accurate and complete;
2. Completeness of test data, tables, charts, and/or graphs as specified in Attachments 1 or 2.

**MAY COMPLETE THIS UNDER A NEW TASK ORDER AT A LATER TIME**

**TASK 6: REPORT REQUIREMENTS**

1. The Technical Progress Report shall address each active Task separately, give a general outline of the effort, state the percentage of work completed during the reporting period, and relate it to the overall effort. Specific discussions shall include any difficulties encountered and the remedial action taken during the reporting period. It shall include an outline of anticipated activity, the manpower requirements, and an estimate of progress to be made during the subsequent reporting period. Any anticipated changes in personnel and a comparison of the work accomplished to the Statement of Work shall also be included.
2. The Financial Progress Report shall show the percentage or status of work completed, number of hours, labor rate applied, and corresponding total dollar amount expended to date for each employee within all categories employed in the performance of the Delivery Order during the reporting period. Also to be included are the cumulative number of hours and corresponding dollar amounts expended to date on all work, Delivery Order estimates of total hours, and the corresponding dollar amounts required to complete the Delivery Order. Contractor shall provide a graph using a vertical axis for dollars and a horizontal axis for expenditures against the total estimated cost of the Delivery Order.

### 3. Draft Report

The contractor shall provide a draft report that:

- Summarizes the findings from the sites,
- Describes in detail the internal tank conditions that may lead to corrosion and UST equipment failure,
- Outlines all testing performed,
- Discusses data and based on data given,
- Suggests the probable condition under which corrosion and failure of the UST system components would most likely occur, and
- Provides photographs that illustrate the corrosion observations.

Appendices shall include:

- A list of standards or protocols used for the sample collection, shipping and sample analysis;
- Data from analytical test runs as part of the forensic analyses conducted by the laboratory;
- Map of UST facility, documentation of any prior upgrades or repairs made to the UST system, release detection information, inventory control information (in available);
- List of people contacted (if possible), and
- UST site information.

### 4. Final Report

#### Task 6 Deliverables:

1. Draft report, in MS Word format
2. Final report, in MS Word format

#### Task 6 Acceptance Criteria:

1. Draft report is organized, adequate, well written and delivered within 12 weeks of completion of chemical analyses.  
contact with tank owner.
2. Feedback from EPA has been addressed and is incorporated in the final report.
3. Report is organized, complete, well written, free of grammatical and typographical errors, and delivered within 14 days upon the receipt of EPA's feedback on the draft report.

## 2 ATTACHMENTS

*There are no changes to Attachments with Modification 3.*

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>		1. CONTRACT ID CODE		PAGE OF PAGES 1 2	
2. AMENDMENT/MODIFICATION NO. 002		3. EFFECTIVE DATE 03/20/2014		4. REQUISITION/PURCHASE REQ. NO.	
5. PROJECT NO. (if applicable)		6. ISSUED BY CP0D US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268		7. ADMINISTERED BY (if other than Item 6) CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) BATTELLE MEMORIAL INSTITUTE 505 KING AVE COLUMBUS OH 432012693		(x)		9A. AMENDMENT OF SOLICITATION NO.	
				9B. DATED (SEE ITEM 11)	
		x		10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-11-038 0016	
				10B. DATED (SEE ITEM 13) 09/06/2013	
CODE (b)(4)		FACILITY CODE			

**11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS**

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.  
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning \_\_\_\_\_ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

**12. ACCOUNTING AND APPROPRIATION DATA (if required)**

See Schedule

**13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.**

CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
X	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	D. OTHER (Specify type of modification and authority) Mutual Agreement between the parties and Battelle's e-mail request dated September 10, 2013

**E. IMPORTANT:** Contractor ☒ is not, ☐ is required to sign this document and return \_\_\_\_\_ copies to the issuing office.

**14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)**

Tax ID Number (b)(4)  
DUNS Number: \_\_\_\_\_

The purpose of this modification is to change the Task Order Contracting Officer's Representative from Jack Hwang to Ryan Haerer.

TOPO: Ryan Haerer

**LIST OF CHANGES:**

Reason for Modification : Other Administrative Action

Continued ...

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Camille W. Davis	
15B. CONTRACTOR/OFFEROR  (Signature of person authorized to sign)	15C. DATE SIGNED	16C. DATE SIGNED 03/20/2014	16B. ELECTRONIC SIGNATURE Camille W. Davis

## CONTINUATION SHEET

REFERENCE NO. OF DOCUMENT BEING CONTINUED

EP-C-11-038/0016/002

PAGE OF

2

2

NAME OF OFFEROR OR CONTRACTOR

BATTELLE MEMORIAL INSTITUTE

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	TOCOR (Task Order Contracting Officer's Representative) changed  From: Jack Hwang To : Ryan Haerer Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center Mail Drop D143-02 109 TW Alexander Drive Durham NC 27711 Period of Performance: 09/14/2011 to 08/31/2016				

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>		1. CONTRACT ID CODE		PAGE OF PAGES 1 4	
2. AMENDMENT/MODIFICATION NO. 001		3. EFFECTIVE DATE 09/12/2013		4. REQUISITION/PURCHASE REQ. NO.	
5. PROJECT NO. (If applicable)		6. ISSUED BY CODE CPOD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268		7. ADMINISTERED BY (If other than Item 6) CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)  BATTELLE MEMORIAL INSTITUTE 505 KING AVE COLUMBUS OH 432012693		(x)		9A. AMENDMENT OF SOLICITATION NO.	
				9B. DATED (SEE ITEM 11)	
		x		10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-11-038 0016	
				10B. DATED (SEE ITEM 13) 09/06/2013	
CODE (b)(4)		FACILITY CODE			
<b>11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS</b>					
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.					
12. ACCOUNTING AND APPROPRIATION DATA (If required) See Schedule					
<b>13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.</b>					
CHECK ONE					
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.					
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).					
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:					
D. OTHER (Specify type of modification and authority)					
X Mutual Agreement between the parties and Battelle's e-mail request dated September 10, 2013					
E. IMPORTANT: Contractor <input checked="" type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.					
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)					
Tax ID Number (b)(4)					
DUNS Number:					
The purposes of this modification are to: correct the Task Order COR; revise the funding break-out; and provide revised task order pages 2 and 3. These are No Cost changes.					
TOPO: Jack Hwang					
LIST OF CHANGES:					
Reason for Modification : Other Administrative Action					
Total Amount for this Modification: \$0.00					
Continued ...					
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.					
15A. NAME AND TITLE OF SIGNER (Type or print)		15A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
		Camille W. Davis			
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED		15C. UNITED STATES OF AMERICA	
(Signature of person authorized to sign)				Camille W. Davis (Signature of Contracting Officer)	
				16C. DATE SIGNED 09/12/2013	
NSN 7540-01-152-8070 Previous edition unusable					
STANDARD FORM 30 (REV. 10-83) Prescribed by GSA FAR (48 CFR) 53.243					

<b>CONTINUATION SHEET</b>	REFERENCE NO. OF DOCUMENT BEING CONTINUED	PAGE	OF
	EP-C-11-038/0016/001	2	4

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4

BATTELLE MEMORIAL INSTITUTE

**ORDER FOR SUPPLIES OR SERVICES  
SCHEDULE - CONTINUATION**

PAGE NO

2

IMPORTANT: Mark all packages and papers with contract and/or order numbers.

DATE OF ORDER  
09/06/2013

CONTRACT NO.  
EP-C-11-038

ORDER NO.  
0016

ITEM NO. (a)	SUPPLIES/SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)
0001	<p>Admin Office: CPOD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268</p> <p>STREAMS2 - Failure Analyses of Underground Storage Tank Equipment in Biofuels Service2 TOCOR: Jack Hwang Alt TOCOR: Michael Pomes Award Type: Cost-plus-fixed-fee Total Estimated Cost: \$(b)(4) Fixed Fee: \$(b)(4) Completion Form</p> <p>Accounting Info: 12-13-B-03P00SP-302D86-2532---1303PK10 06-001 BFY: 12 EFY: 13 Fund: B Budget Org: 03P00SP Program (PRC): 302D86 Budget (BOC): 2532 DCN - Line ID: 1303PK1006-001 Funding Flag: Partial Cost: \$111,300.00 Funded: \$111,300.00</p> <p>Accounting Info: 12-13-B-03P00SP-302D86-2505---1303PK10 06-002 BFY: 12 EFY: 13 Fund: B Budget Org: 03P00SP Program (PRC): 302D86 Budget (BOC): 2505 DCN - Line ID: 1303PK1006-002 Funding Flag: Partial Cost: \$(b)(4) Funded: \$14,482.00 Fee:  Period of Performance: 09/06/2013 to 09/30/2014</p> <p>The obligated amount of award: \$125,782.00. The total for this award is shown in box 17(i).</p> <p>The balance of \$6,670.00 is kept on the Task Order to be applied toward future orders of additional pre-investigations and failure analyses as provided in the T.O. PWS.</p>				125,782.00	

TOTAL CARRIED FORWARD TO 1ST PAGE (ITEM 17(H))

\$125,782.00

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PREVIOUS EDITION NOT USABLE

OPTIONAL FORM 348 (Rev. 4/2008)  
Prescribed by GSA FPMR (41 CFR) 101-11.6

**PERFORMANCE WORK STATEMENT  
STREAMS II  
Task Order 0016, Battelle EP-C-11-038**

**TITLE:** Failure Analyses of Underground Storage Tank Equipment in Biofuels Service II

<b>Task Order Manager (TOM)</b>	<b>Alternate Task Order Manager (ATOM)</b>
<b>Name:</b> Jack Hwang	<b>Name:</b> Michael Pomes
<b>Office:</b> U.S. EPA, Region 3 Land and Chemicals Division Office of State Programs 1650 Arch Street, MC 3LC10 Philadelphia, PA 19103-2029	<b>Office:</b> U.S. EPA – Region 7 901 North Fifth Street, MC AWMSTOP Kansas City, KS 66101
<b>Phone:</b> (215) 814-3387	<b>Phone:</b> (913) 551-7216
<b>Fax:</b> (215) 814-3163	<b>Fax:</b> (913) 551-9216
<b>Email:</b> Hwang.Jack@epa.gov	<b>Email:</b> <a href="mailto:Pomes.Michael@epa.gov">Pomes.Michael@epa.gov</a>

**PERIOD OF PERFORMANCE:** September 6, 2013 through September 30, 2014  
A 1-year Task Order extension may be performed at a later date.

Up to thirty five (35) exploratory pre-investigations and four (4) in-depth failure analyses may be performed during the period of performance.

**BACKGROUND**

Biofuels will provide a greater contribution to the fuel supply in the United States because of the Renewable Fuel Standard established by the Energy Policy Act of 2005 and amended by the Energy Independence and Security Act of 2007. These federal mandates have spurred a significant increase in biofuel production as well as an increase in the number of retail facilities storing and dispensing renewable fuels such as ethanol and biodiesel. Introduction of biofuels to underground storage tank (UST) systems has created concerns about how these fuels react with the materials found in UST systems. 40 Code of Federal Regulations 280.32 requires that owners and operators use an UST system made of or lined with materials that are compatible with the substance stored in those UST systems.

Due to concerns over compatibility of biofuel blends with UST equipment, in June 2011, EPA issued guidance on compatibility of UST systems with biofuel blends. This document, "Compatibility of Underground Storage Tank Systems with Biofuel Blends," provides options for UST owners and operators to use in complying with the federal compatibility requirement for UST systems containing greater than 10% ethanol or diesel containing greater than 20% biodiesel. In that guidance, EPA lists the following UST system components to be critical for demonstrating compatibility:

# ORDER FOR SUPPLIES OR SERVICES

PAGE OF PAGES

1 65

IMPORTANT: Mark all packages and papers with contract and/or order numbers.

1. DATE OF ORDER 09/06/2013		2. CONTRACT NO. (If any) EP-C-11-038		6. SHIP TO: a. NAME OF CONSIGNEE Region 3			
3. ORDER NO. 0016		4. REQUISITION/REFERENCE NO. PR-R3-13-00311		b. STREET ADDRESS US Environmental Protection Agency 1650 Arch Street			
5. ISSUING OFFICE (Address correspondence to) CPOD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268		c. CITY Philadelphia		d. STATE PA	e. ZIP CODE 19103-2029		
7. TO: a. NAME OF CONTRACTOR BATTELLE MEMORIAL INSTITUTE				f. SHIP VIA			
b. COMPANY NAME				8. TYPE OF ORDER <input type="checkbox"/> a. PURCHASE <input checked="" type="checkbox"/> b. DELIVERY			
c. STREET ADDRESS 505 KING AVE				REFERENCE YOUR:  Please furnish the following on the terms and conditions specified on both sides of this order and on the attached sheet, if any, including delivery as indicated.			
d. CITY COLUMBUS		e. STATE OH	f. ZIP CODE 432012693				
9. ACCOUNTING AND APPROPRIATION DATA See Schedule				10. REQUISITIONING OFFICE CPOD			
11. BUSINESS CLASSIFICATION (Check appropriate box(es)) <input type="checkbox"/> a. SMALL <input checked="" type="checkbox"/> b. OTHER THAN SMALL <input type="checkbox"/> c. DISADVANTAGED <input type="checkbox"/> d. WOMEN-OWNED <input type="checkbox"/> e. HUBZone <input type="checkbox"/> f. SERVICE-DISABLED VETERAN-OWNED <input type="checkbox"/> g. WOMEN-OWNED SMALL BUSINESS (WOSB) ELIGIBLE UNDER THE WOSB PROGRAM <input type="checkbox"/> h. EDWOSB							12. F.O.B. POINT Destination
13. PLACE OF a. INSPECTION Destination		b. ACCEPTANCE Destination		14. GOVERNMENT B/L NO.		15. DELIVER TO F.O.B. POINT ON OR BEFORE (Date)	
16. DISCOUNT TERMS							
17. SCHEDULE (See reverse for Rejections)							
ITEM NO. (a)	SUPPLIES OR SERVICES (b)			QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)
	Tax ID Number: (b)(4) DUNS Number: Failure Analyses of Underground Storage Tank Equipment in Biofuels Service II TOPO: Patty Schwenke Continued ...						
18. SHIPPING POINT		19. GROSS SHIPPING WEIGHT		20. INVOICE NO.		17(h) TOTAL (Cont. pages)	
21. MAIL INVOICE TO:							
a. NAME RTP Finance Center						\$125,782.00	
b. STREET ADDRESS (or P.O. Box) US Environmental Protection Agency RTP-Finance Center Mail Drop D143-02 109 TW Alexander Drive						\$125,782.00	
c. CITY Durham		d. STATE NC	e. ZIP CODE 27711				17(i) GRAND TOTAL
22. UNITED STATES OF AMERICA BY (Signature)				23. NAME (Typed) Camille W. Davis TITLE: CONTRACTING/ORDERING OFFICER			

**ORDER FOR SUPPLIES OR SERVICES**  
**SCHEDULE - CONTINUATION**

PAGE NO

2

IMPORTANT: Mark all packages and papers with contract and/or order numbers.

DATE OF ORDER

CONTRACT NO.

ORDER NO.

09/06/2013

EP-C-11-038

0016

ITEM NO. (a)	SUPPLIES/SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)
0001	<p>Admin Office: CPOD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: NWD Cincinnati OH 45268 Period of Performance: 09/14/2011 to 08/31/2016</p> <p>STREAMS2 - Failure Analyses of Underground Storage Tank Equipment in Biofuels Service2 TOCOR: Jack Hwang Alt TOCOR: Andrea Barbary Award Type: Cost-plus-fixed-fee Total Estimated Cost: \$(b)(4) Fixed Fee: \$(b)(4) Completion Form</p> <p>Accounting Info: 12-13-B-03P00SP-302D86-2532---1303PK10 06-001 BFY: 12 EFY: 13 Fund: B Budget Org: 03P00SP Program (PRC): 302D86 Budget (BOC): 2532 DCN - Line ID: 1303PK1006-001 Funding Flag: Partial Funded: \$111,300.00</p> <p>Accounting Info: 12-13-B-03P00SP-302D86-2505---1303PK10 06-002 BFY: 12 EFY: 13 Fund: B Budget Org: 03P00SP Program (PRC): 302D86 Budget (BOC): 2505 DCN - Line ID: 1303PK1006-002 Funding Flag: Partial Funded: \$14,482.00 Period of Performance: 09/06/2013 to 09/30/2014</p> <p>The obligated amount of award: \$125,782.00. The total for this award is shown in box 17(i).</p>				125,782.00	

TOTAL CARRIED FORWARD TO 1ST PAGE (ITEM 17(H))

\$125,782.00

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Prescribed by GSA FAR (48 CFR) 53.213(f)

**PERFORMANCE WORK STATEMENT  
STREAMS II  
Task Order 0016, Battelle EP-C-11-038**

**TITLE:** Failure Analyses of Underground Storage Tank Equipment in Biofuels Service II

<b>Task Order Manager (TOM)</b>	<b>Alternate Task Order Manager (ATOM)</b>
<b>Name:</b> Patricia Schwenke	<b>Name:</b> Michael Pomes
<b>Office:</b> U.S. EPA, Region 3 Land and Chemicals Division Office of State Programs 1650 Arch Street, MC 3LC10 Philadelphia, PA 19103-2029	<b>Office:</b> U.S. EPA – Region 7 901 North Fifth Street, MC AWMDSTOP Kansas City, KS 66101
<b>Phone:</b> (215) 814-2903	<b>Phone:</b> (913) 551-7216
<b>Fax:</b> (215) 814-3113	<b>Fax:</b> (913) 551-9216
<b>Email:</b> <a href="mailto:Schwenke.Patricia@epa.gov">Schwenke.Patricia@epa.gov</a>	<b>Email:</b> <a href="mailto:Pomes.Michael@epa.gov">Pomes.Michael@epa.gov</a>

**PERIOD OF PERFORMANCE:** September 6, 2013 through September 30, 2014

A 1-year Task Order extension may be performed at a later date.

Up to thirty five (35) exploratory pre-investigations and four (4) in-depth failure analyses may be performed during the period of performance.

**BACKGROUND**

Biofuels will provide a greater contribution to the fuel supply in the United States because of the Renewable Fuel Standard established by the Energy Policy Act of 2005 and amended by the Energy Independence and Security Act of 2007. These federal mandates have spurred a significant increase in biofuel production as well as an increase in the number of retail facilities storing and dispensing renewable fuels such as ethanol and biodiesel. Introduction of biofuels to underground storage tank (UST) systems has created concerns about how these fuels react with the materials found in UST systems. 40 Code of Federal Regulations 280.32 requires that owners and operators use an UST system made of or lined with materials that are compatible with the substance stored in those UST systems.

Due to concerns over compatibility of biofuel blends with UST equipment, in June 2011, EPA issued guidance on compatibility of UST systems with biofuel blends. This document, "Compatibility of Underground Storage Tank Systems with Biofuel Blends," provides options for UST owners and operators to use in complying with the federal compatibility requirement for UST systems containing greater than 10% ethanol or diesel containing greater than 20% biodiesel. In that guidance, EPA lists the following UST system components to be critical for demonstrating compatibility:

- Tank or internal tank lining
- Piping
- Line leak detector
- Flexible connectors
- Drop tube
- Spill and overfill prevention equipment
- Submersible turbine pump and components
- Sealants (including pipe dope and thread sealant), fittings, gaskets, o-rings, bushings, couplings, and boots
- Containment sumps (including submersible turbine sumps and under dispenser containment)
- Release detection floats, sensors, and probes
- Fill and riser caps
- Product shear valve

These components are likely to be in direct contact with fuel, and if incompatible with the fuel, may lead to a release to the environment. For more background information regarding the compatibility of UST system components with biofuel blends, please see EPA's guidance at: <http://www.epa.gov/oust/altfuels/biofuelsguidance.htm> .

Recent tank failures involving tanks containing ethanol or biodiesel have come to the attention of EPA. A better understanding of the root cause of such equipment failure can prevent future releases to the environment from a UST system and reduce the pollution to ground water.

### **Location**

Exact site location is to be determined. Upon identification of an incident during which a UST component has failed, EPA will contact the contractor and provide contact information for the tank owner, the UST service provider, the state or local emergency responder, and/or other individuals having knowledge of the facility and equipment failure. Exploratory pre-investigation may be performed at some sites. Based on the results of preliminary investigation EPA will determine whether the site will be selected for case study of in-depth failure analyses. The contractor will coordinate shipping of samples collected at the site to its laboratory for analyses.

### **Purpose**

EPA is interested in studying UST incidents where components have failed because of possible material incompatibility with biofuels or other yet-to-be- determined circumstances. The contractor shall provide field support to EPA including: collection and documentation of information relevant to the site, equipment, or failure mode; preparation of sampling kits and sampling instructions to the site; and analyses of samples shipped from the site. The contractor

shall assist EPA by conducting forensic analyses of pertinent UST components collected during the course of UST leak investigation. Specifically, the purpose of this investigation is to use methods of forensic investigation to determine the structural, mechanical, or chemical mode of failure for failed UST components because of incompatibility with biofuels or some other yet to be determined circumstances.

## **TASKS**

### **TASK 1: EXPLORATORY PRE-INVESTIGATION**

Once EPA becomes aware of UST sites appropriate for pre-investigation, the EPA Contracting Officer Representative will provide more specific information to the contractor. The contractor will coordinate pre-investigations of up to thirty five potential case studies to aid EPA in making a decision about choosing a site as a case study for in-depth failure analyses.

The pre-investigation activities include

1. a visualization of the in-tank circumstances using a video recorder,
2. gaining clarification and/or more details to the site circumstances (i.e., automatic tank gauging records, maintenance records, and general information), and
3. depending on whether fuel is available for sampling, the technician will also collect the necessary liquid samples and ship them to the contractor's laboratory.
4. The samples will be stored appropriately for chemical and biological analyses. If the site is designated a case study, these samples will be analyzed according to the site-specific QAPP.

Once the data are collected on site, they will be combined with the initial information reported by the site owner/operator into a pre-investigation memo that will accompany the in-tank video DVD.

#### Task 1 Deliverables:

1. A pre-investigation memo that accompanies the in-tank video DVD.

#### Task 1 Acceptable Criteria:

1. Pre-investigation memo summarizes the findings that address the items numbered above;
2. The in-tank video DVD is in good quality
3. When necessary using selective images from the DVD to support the recommendation to aid EPA in making decision about naming the site for in-depth failure analyses.

## **TASK 2:     Site-Specific QUALITY ASSURANCE PROJECT PLAN (QAPP)**

Once EPA becomes aware of an UST site appropriate for the in-depth failure analyses, the EPA Contracting Officer Representative will provide more specific information to the contractor. The contractor will then have five (5) days to deliver to EPA a project-specific QAPP, using elements described in the general QAPP which was approved by EPA (Attachment 1).

### Task 2 Deliverables:

1. A Site-specific QAPP, once an appropriate site has been identified. The site-specific QAPP must be delivered for EPA review and approval at least five (5) days prior to the collection of samples or, at a date specified by the EPA TOM.

### Task 2 Acceptance Criteria:

1. List of standards and/or protocols is adequate;
2. The shipping plan is adequate and meets DOT requirements for shipping hazardous materials.
3. Site-specific QAPP clearly identifies what information will be sought, and what analysis will be performed in order to determine the root cause(s) of equipment failure and identify causes of equipment failure.

## **TASK 3:     INFORMATION GATHERING**

Upon identification of an incident during which a UST component has failed, EPA will contact the contractor and provide contact information for the tank owner, the UST service provider, the state or local emergency responder, and/or other individuals having knowledge of the facility and equipment failure. The contractor will work with knowledgeable individuals to obtain the following information:

1. Date and time of incident
2. Location of incident (state and city);
3. Map showing the UST facility showing the location of all components of the UST system including vents, piping and conduit runs, as well as, the location of failure or failed components;
4. Tank and piping information including tank type and age, volume of tank, dimension of the tank, type and age of piping, types of sealants and dopes used on the pipe;
5. Information on any repairs or upgrade made to the UST system prior to the tank or component failure;
6. Fuel stored, including octane and biofuel content, and the height of tank when problem occurred;
7. Bill of lading or drop ticket from the date of the last fuel delivery, any typical monthly throughput, release detection records for the past 12 months prior to the tank or

- component failure, also if available, inventory control records for the past 12 months prior to the tank or component failure;
8. Failed UST component, including manufacture and date of installation;
  9. Failure mode, and other relevant details about the equipment;
  10. Whether any product was released to the environment in association with the equipment failure;
  11. Any photographs showing failed components, as well as, the UST system that were taken by the tank owner, UST service provider, state or local emergency responder, or other individual knowledgeable of the facility and equipment failure;
  12. Any other information relevant to the site, equipment, or failure mode.

#### Task 3 Deliverables:

1. Summary of findings, as part of forensic report, that address the items numbered above;
2. List of people contacted (if they are willing to be named), provided in an appendix to the forensic report;
3. Detailed map of the UST facility that includes the items listed above;
4. Photographs shot at the UST facility where the component failure took place;
5. Data or copies of documents mentioned in the items numbered above: tank dimension, documentation of repairs and upgrades made to the UST system, bills of lading or drop tickets, release detection records, inventory control records (if available).

#### Task 3 Acceptance Criteria:

1. Reasonable effort made to collect all information and justification for not obtaining data;
2. Summary of information collected is clear, concise, and presented in an understandable way;
3. Documents, maps, data and photographs provided as specified in the deliverables.

### **TASK 4: OBTAINING SAMPLES**

The contractor will provide instructions to the site for collection, storage, and shipping of samples prior, which may include a maximum holding time for samples. The contractor may use ASTM E2733, "Standard Guide for Investigation of Equipment Problems and Releases for Petroleum Underground Storage Tank Systems," or an equivalent SOP for investigation of equipment problems, including documentation of findings and sample preparation. The contractor will provide instructions for shipping samples that meet DOT requirements for shipping hazardous materials. Overall, the contractor will also coordinate the shipping to its laboratory of any UST components suspected of failure due to incompatibility or other yet-to-be-

determined causes. EPA will inform the contractor when the failed UST equipment becomes available, and will provide that information to the contractor for preparing the instructions for sample collection.

Task 4 Deliverables:

1. List of standards and/or protocols used for sample collection and shipping.
2. Shipping plan for the categories of samples listed in ASTM E2733.

Task 4 Acceptance Criteria:

1. List of standards and/or protocols is accurate and complete;
2. Evidence showing the shipping plan is being followed.

**TASK 5: SAMPLE ANALYSES**

The contractor shall analyze the samples shipped from case studies of failures, using internationally-recognized sampling and testing protocols, in order to determine the root cause of equipment failure.

Task 5 Deliverables:

1. List of standards and/or protocols used for sample analysis, provided in the appendix to the forensic report (can be combined with the deliverable from Task 3);
2. Test data, tables, charts, and/or graphs, provided in an appendix to the forensic report (laboratory deliverables shall contain all information listed in Attachments 1 or 2, as applicable to the type of analyses requested (i.e., organic or inorganic)).

Task 5 Acceptance Criteria:

1. List of standards and/or protocols is accurate and complete;
2. Completeness of test data, tables, charts, and/or graphs as specified in Attachments 1 or 2.

**TASK 6: REPORT REQUIREMENTS**

1. The Technical Progress Report shall address each active Task separately, give a general outline of the effort, state the percentage of work completed during the reporting period, and relate it to the overall effort. Specific discussions shall include any difficulties encountered and the remedial action taken during the reporting period. It shall include an outline of anticipated activity, the manpower requirements, and an estimate of progress to be made during the subsequent reporting period. Any anticipated changes in personnel and a comparison of the work accomplished to the Statement of Work shall also be included.

2. The Financial Progress Report shall show the percentage or status of work completed, number of hours, labor rate applied, and corresponding total dollar amount expended to date for each employee within all categories employed in the performance of the Delivery Order during the reporting period. Also to be included are the cumulative number of hours and corresponding dollar amounts expended to date on all work, Delivery Order estimates of total hours, and the corresponding dollar amounts required to complete the Delivery Order. Contractor shall provide a graph using a vertical axis for dollars and a horizontal axis for expenditures against the total estimated cost of the Delivery Order.

3. Draft Report

The contractor shall provide a draft report for each case study that:

- Summarizes the findings from the site,
- Describes in detail the UST equipment failure,
- Outlines all testing performed,
- Discusses data and based on data given,
- Suggests the probable mode of failure for the UST component, and
- Provides photographs that illustrate the component failure.

Appendices shall include:

- A list of standards or protocols used for the sample collection, shipping and sample analysis;
- Data from analytical test runs as part of the forensic analyses conducted by the laboratory;
- Map of UST facility, documentation of any prior upgrades or repairs made to the UST system, release detection information, inventory control information (in available);
- List of people contacted (if possible), and
- UST system and site information.

4. Final Report

Task 6 Deliverables:

1. Draft report, in MS Word format
2. Final report, in MS Word format

Task 6 Acceptance Criteria:

1. Draft report is organized, adequate, well written and delivered with 12 weeks of initial contact with tank owner.
2. Feedback from EPA has been addressed and is incorporated in the final report.
3. Report is organized, complete, well written, free of grammatical and typographical

errors, and delivered within 14 days upon the receipt of EPA's feedback on the draft report.

## **2 ATTACHMENTS**

1. General Quality Assurance Project Plan (QAPP) for Failure Analysis of Underground Storage Tank Equipment in Biofuels Service II
2. Instructions for Field Sampling

# **ATTACHMENT 1**

**General Quality Assurance Project Plan (QAPP)**

**For**

**Failure Analyses of Underground Storage Tank Equipment in Biofuels Service2**

## **Section A: Project Management**

### **A1 LIST OF ABBREVIATIONS/ACRONYMS**

ABAT	Applied Biology and Aerosol Technology
AMA	Advanced Materials Applications
ANSI	American National Standards Institute
API	American Petroleum Institute
ASTM	ASTM (American Society for Testing and Materials) International
BLAST*	Basic Local Alignment Search Tool
bp	base pairs
COC	Chain of Custody
DQO	Data Quality Objective
DSC	differential scanning calorimetry
EDS	Energy Dispersive Spectrometry
EPA	Environmental Protection Agency
HCS	HiSeq Control Software
ID	identification
L	liter
Lpm	liters per minute
LRB	Laboratory Record Book
MIC	microbial-influenced corrosion
mL	milliliter
MQO	Measurement quality objectives
NACE	National Association of Corrosion Engineers
NCH	Nationwide Children's Hospital
NIST	National Institute of Standards and Technology

PEI	Petroleum Equipment Institute
ppm	parts per million
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RMO	Records Management Office
RTA	Real Time Analysis
SEM	Scanning Electron Microscopy
SOP	Standard Operating Procedure
STI	Steel Tank Institute
STREAMS	Scientific, Technical, Research, Engineering, and Modeling Support
TGA	thermogravimetric analysis
TOL	Task Order Leader
TOM	Task Order Manager
UST	Underground Storage Tank

## **A2 PROJECT TASK ORGANIZATION**

The Vendor is conducting an investigation of failed underground storage tank (UST) equipment failures related to biofuels service. The project is being conducted under the direction of the U.S. Environmental Protection Agency's (EPA) National Biofuels Team through the Scientific, Technical, Research, Engineering, and Modeling Support (STREAMS II) contract. The organization chart will be shown and includes the key individuals from the Vendor, EPA, and Vendor's subcontractor (if any) who will have responsibilities in the investigation.

## **A3 PROBLEM DEFINITION/BACKGROUND**

Biofuels contribute an increasing portion of the U.S. fuel supply in the United States due to the enactment of the Renewable Fuel Standard established by the Energy Policy Act of 2005 and amended by the Energy Independence and Security Act of 2007. These federal mandates have spurred increased production, distribution, dispensing and use of biofuels, particularly in the transportation sector where the use of ethanol-blended gasoline and biodiesel is becoming more widespread. 40 Code of Federal Regulations 280.32 (EPA 40 CFR 280.32) requires that owners and operators use an UST system made of or lined with materials that are compatible with the substance stored in those UST systems. However, there are uncertainties about how the biofuels react with the materials and components in UST systems. These concerns prompted the US EPA to issue guidance on the compatibility of biofuel blends with UST equipment. The June 2011 document, "Compatibility of Underground Storage Tank Systems with Biofuel Blends," provides options for UST owners and operators to facilitate compliance with the federal compatibility requirement for UST systems containing greater than 10% ethanol or diesel containing greater than 20% biodiesel. The UST system components that are considered to be critical for demonstrating compatibility include:

Tank or internal tank lining

- Piping
- Line leak detector
- Flexible connectors
- Drop tube
- Spill and overfill prevention equipment
- Submersible turbine pump and components
- Sealants (including pipe dope and thread sealant), fittings, gaskets, o-rings, bushings, couplings, and boots

- Containment sumps (including submersible turbine sumps and under dispenser containment)
- Release detection floats, sensors, and probes
- Fill and riser caps
- Product shear valve

These components are likely to be in direct contact with fuel, and if incompatible with the fuel, may lead to a release to the environment. For more background information regarding the compatibility of UST system components with biofuel blends, please see EPA's guidance at: <http://www.epa.gov/oust/altfuels/biofuelsguidance.htm>.

Recent tank failures involving tanks containing 10% ethanol have come to the attention of EPA. A better understanding of the root cause of such equipment failure can prevent future releases to the environment from a UST system and reduce the pollution to groundwater.

EPA is interested in studying these and other unusual UST incidents where components have failed because of possible material incompatibility with biofuels or other yet-to-be-determined circumstances. Vendor will provide: collection and documentation of information relevant to the site, equipment, or failure mode; preparation of sampling kits and sampling instructions to the site; and analyses of samples shipped from the site. Then the Vendor will conduct forensic analyses of pertinent UST components collected at the case study site, using chemical, biological, and forensics methods to analyze the samples. The final result of each case study investigation is a forensics report presenting all data collected and suggestions to a probable mode of failure.

#### **A4 PROJECT TASK DESCRIPTION**

The objective of this TO is to determine a probable root cause of UST system failures when used with biofuels. The overall approach to determining the cause of failure is described and guided by the general QAPP (this document, Task 1a) and the subsequent Project-Specific QAPP (Task 1b) (one for each case study investigated). This QAPP is prepared in accordance with the STREAMS II Quality Management Plan (QMP)<sup>1</sup> and addresses general UST site inspection considerations following ASTM International (ASTM) Method E2733 *Standard Guide for Investigation of Equipment Problems and Releases for Petroleum Underground Storage Tank Systems*<sup>2</sup>. This will facilitate the identification of the appropriate level of investigation once the project-specific case studies are identified.

Once a case study has been identified, protocols within this document for collecting initial response data will be used to inform the Site-Specific QAPP. The Site-Specific QAPP will identify the approach for investigating and reporting the failure of the UST system case study, including additional information gathering, obtaining samples, analyzing the samples and preparation of the case study forensics report. The Site-Specific QAPP will identify the laboratory analyses needed for the different fuel, water (if any), vapor (if any), and equipment samples removed from the UST; the shipping, preservation, and storage needs of the specific samples to be collected; and depending on the release, the site inspection timing, i.e., undisturbed/operating tank system, during excavation but prior to equipment removal, or during and after equipment removal.

The Vendor will conduct a detailed on-site inspection per case study. The Vendor and/or its subcontractor have special certifications and safety training to conduct on-site investigative techniques (described below) that will enable robust and comprehensive data collection. Depending on the type of tank failure, these techniques will be instrumental in determining the cause of tank failure prior to removing or altering the system.

Once samples are taken, the specific types of analyses to be conducted are organized into three categories, depending on the fuel type (ethanol blends, diesel, bio-diesel, etc.), the equipment sampled, and the circumstances of the system failure (mechanical failure and/or material incompatibility).

- *Chemical analyses:* Fuel, along with water and vapor (if available) will be analyzed by widely accepted and readily used American Society for Testing and Materials (ASTM) methods to identify chemical characteristics for the specific type of fuel from the case study site. These analyses will be performed by a contract laboratory with ISO 9001 certification, Intertek. Any non-ASTM methods deemed to be necessary will follow a documented procedure (i.e., standard operating procedures) with specified measurement quality objectives (MQOs). If necessary, additional contract laboratories may be used for non-ASTM methods and would be specified in the Site-Specific QAPPs.
- *Biological analysis:* Microbiological activity leading to microbial-influenced corrosion (MIC) may be a significant contributing factor to UST system failures. Liquid and or sludge samples will be analyzed using Metagenomics sequencing and Bioinformatics (software based analysis of genetic material) to identify unknown microbes and all DNA present in the samples. This approach is superior and more useful than traditional culture methods<sup>3</sup>, particularly for understanding the complex interactions that occur within USTs.

- *Forensics analyses:* The UST equipment parts and/or corrosion scrapings removed from the case study sites will undergo varying forensic analyses. In the failure of equipment, the functionality and the material compatibility are the two main components to address when investigating the root cause of failure. Equipment removed will undergo an investigation from both engineering and corrosion perspectives.

Consolidate all of the data and preparing a concise and comprehensive draft forensics report for each case study. The Vendor will summarize the findings from the site (including photos), describe the UST equipment failure, outline all testing performed, discuss data and based on data, give suggestions to the probable mode of failure for the UST component in a draft forensics report. Upon receipt of feedback from EPA on the draft forensic report, the final forensic report will be submitted by the Vendor.

#### **A5      QUALITY OBJECTIVES AND CRITERIA**

The overall data quality objective (DQO) of this study is to determine if biofuel characteristics contribute to the failure of UST equipment, resulting in leaks. This project will include two major components that involve making measurements: 1) on-site case study data collection and sampling of fuel, headspace vapor (if present), corrosion substrate (if present), failed equipment (if necessary) and water (if present) from USTs, 2) laboratory chemical, biological, and forensics analyses that will be performed on the collected samples. Most of the measurements will follow standard analytical methods that have been published and accepted by either ASTM, American National Standards Institute (ANSI), National Association of Corrosion Engineers (NACE), or the EPA. Detailed QC requirements for potential methods are provided in Section B5 and in each applicable standard method. Some method specific MQOs are listed in Table 4.

#### **A6      SPECIAL TRAINING CERTIFICATION**

The staff of the Vendor and/or its subcontractor who will be performing the site inspections and fuel and water sampling will have documented training pertinent to their function in the inspection and sampling process. Prior to inspection/sampling, each field staff member will be required to review the applicable ASTM sampling methods and have experience or become adequately trained with the required sampling equipment. This training/experience will be documented in the project records. Analysis laboratories will be required to provide documented support for their proficiency in performing the required analyses in a thorough and safe manner with proper attention to QC samples and waste

disposal. Laboratory compliance with the MQOs will be demonstrated by QC data and data flags provided by the laboratories performing analyses.

#### **A7 DOCUMENTS AND RECORDS**

Project staff (Vendor and/or its subcontractor, analysis laboratories) will record all relevant aspects of this project in laboratory record books (LRBs), electronic files (both raw data produced by applicable analytical methods and spreadsheets containing various statistical calculations), audit reports, and other project reports. Table 1 includes the records that each organization will include in their project records to be submitted to the TOL. The TOL will review all of these records within seven days of receipt and maintain them in her office during the project. At the conclusion of the project, the TOL will transfer the records to permanent storage at the Vendor's Records Management Office (RMO). The Vendor QA Manager will maintain all quality records. All Vendor LRBs are stored indefinitely by Vendor's RMO.

All data generated during the course of this project must be able to withstand challenges to their validity, accuracy, and legibility. To meet this objective, data are recorded in standardized formats and in accordance with prescribed procedures. The documentation of all environmental data collection activities must meet the following minimum requirements:

- Data must be documented directly, promptly, and legibly. All reported data must be uniquely traceable to the raw data. All data reduction formulas must be documented.
- Handwritten data must be recorded in ink. All original data records include, as appropriate, a description of the data collected, units of measurement, unique sample identification (ID) and station or location ID (if applicable), name (signature or initials) of the person collecting the data, and date of data collection.
- Any changes to the original (raw data) entry must not obscure the original entry and must be made with a single line cross out. The change must be initialed and dated by the person making the change.
- The use of pencil, correction fluid, and erasable pen is prohibited.

**Table 1. Project Records Submitted to the TOL**

Organization	Records	Submission Deadline
Vendoe	LRBs, result raw data spreadsheets	Within one week of completion of generation of record
Vendor or its subcontractor	Site protocol checklist, site protocol data forms, sample chain of custody forms, training documentation	Scanned copy of documents emailed to the TOL within one week of generation of record
Analysis laboratories	LRBs, result raw data spreadsheets, QC and calibration data, chain of custody forms, training documentation	Copies of all records emailed to the TOL within one week of analysis

## **Section B: DATA GENERATION AND ACQUISITION**

### **B1 SAMPLE PROCESS DESIGN (EXPERIMENTAL DESIGN)**

The following sections will guide execution of this task order.

#### **B1.1 Information Gathering**

Upon identification of an incident during which a UST component has failed, EPA will contact the Vendor and provide contact information for the tank owner, the UST service provider, the state or local emergency responder, and/or other individuals having knowledge of the facility and equipment failure. The Vendor will work with knowledgeable individuals to obtain as much of the following information as possible before preparing the Site-Specific QAPP. The remaining information will be gathered during the site inspections or an explanation will be included in the forensics report as to why it was not or could not be obtained.

13. Date and time of incident;
14. Location of incident (state and city);
15. Map showing the UST facility showing the location of all components of the UST system including vents, piping and conduit runs, as well as, the location of failure or failed components;
16. Tank and piping information including tank type and age, volume of tank, dimension of the tank, type and age of piping, types of sealants and dopes used on the pipe;
17. Information on any repairs or upgrades made to the UST system prior to the tank or component failure;
18. Fuel stored, including octane and biofuel content, and the height of tank when problem occurred;
19. Bill of lading or drop ticket from the date of the last fuel delivery, any typical monthly throughput, release detection records for the past 12 months prior to the tank or component failure, also if available, inventory control records for the past 12 months prior to the tank or component failure;
20. Failed UST component, including manufacture and date of installation;
21. Failure mode, and other relevant details about the equipment;
22. Whether any product was released to the environment in association with the equipment failure;

23. Any photographs showing failed components, as well as, the UST system that were taken by the tank owner, UST service provider, state or local emergency responder, or other individual knowledgeable of the facility and equipment failure; and
24. Any other information relevant to the site, equipment, or failure mode.

## **B1.2 Obtaining Samples - Case Study Site Inspection**

On a federal level, site owners must notify EPA of an UST release 20 days after confirmation of the tank system failure. The ideal time to collect fuel, water, and vapor samples is the time window between confirmation of the release and product removal from the tank. Therefore, rapid mobilization for information gathering and sampling will be necessary to capture the most relevant data and samples. This QAPP includes sampling information and references necessary for informing individuals on-site of proper sampling techniques, should instructions need to be prepared for non-TO staff (i.e., state/local emergency responder, UST service provider). Appendix A is a Sample Shipping Plan for samples collected at the site. Once a case study is identified, Appendix A may be updated in the Project-Specific QAPP to aid in obtaining samples.

Once the Site-Specific QAPP is approved by EPA, the Vendor will perform an in-depth site inspection of the case study. The inspection will include visual documentation of the case study site (photos and/or video), on-site investigation techniques, sample collection and completion of the data listed in Section B1.2 above. Appendix C includes an example inspection checklist to be revised for inclusion into the Project-Specific QAPPs. Appendix D includes a job safety analysis, which details all critical actions performed once staff arrive at the case study site and the possible hazards.

### **B1.3.1 On-site Investigation Techniques**

The Vendor shall use the established technologies for the internal inspection of USTs including inspections of bare steel, coated steel, and fiberglass tanks using in-tank video inspection systems. With these systems, leaks, corrosion, deflection, delamination, cracks, and other failures of underground storage tanks will be examined. Table 2 presents the potential on-site techniques that can be used to investigate the root cause of UST failure.

### **B1.3.2 Sampling**

As part of the initial sampling and/or in-depth site inspection, liquid samples will be collected using a closed-core type sampling thief (TL-3573, Gammon, Manasquan, New Jersey), similar to the one shown in **Error! Reference source not found.** If possible, one vapor sample will be collected using 3-liter (L) Tedlar bags and another will be collected by pumping air through one or more sorbent cartridges. These samples will be collected from the ullage (tank headspace) vapor. In addition, corrosion substrate from the tank bottom, tank sides, ullage space, and tank equipment may be collected for analyses.

**Table 2. Potential On-Site Techniques**

Technique	Equipment Manufacturer	Conducted in Accordance With
Fuel Sample Collection	Bacon Bomb or Vacuum Sampler	ASTM D7464-08 <sup>3</sup>
Water Bottom Sample Collection	Bacon Bomb or Vacuum Sampler	ASTM D7464-08 <sup>3</sup>
Site Survey	Various	PEI RP-900 <sup>4</sup>
Site Photographs	Nikon; Canon	PEI RP-900 <sup>4</sup>
VacuTest® Tank Tightness Test	Tanknology or equivalent	EPA 40CFR280.43
SureTest™ Tank Tightness Test	Tanknology or equivalent	EPA 40CFR280.43
TLD-1™ Line Tightness Test	Tanknology or equivalent	EPA 40CFR280.44
LDT-5000™ Leak Detector Test	Tanknology or equivalent	Red Jacket; Vaporless; Franklin Fueling
Helium Leak Location	Radiodetection	Proprietary Tanknology Procedures or equivalent
PetroScope® Tank Video Inspection	Tanknology or equivalent	ASTM G-158 <sup>5</sup>
TankCam™ Tank Video Inspection	Tanknology or equivalent	Proprietary Tanknology Procedures or equivalent
SuperJet™ Tank Cleaning	Tanknology or equivalent	Proprietary Tanknology Procedures or equivalent
FuelPure™ Fuel Filtration	Tanknology or equivalent	Proprietary Tanknology Procedures or equivalent
Tank Deflection and Bottom Flatness Test	Tanknology or equivalent	Proprietary Tanknology Procedures or equivalent
Tank Lining Hardness & Thickness Test	Tanknology or equivalent	Proprietary Tanknology Procedures or equivalent
Cathodic Protection Survey	Tanknology or equivalent	NACE RP-0285 <sup>6</sup>
ATG System Certification	Tanknology or equivalent	Manufacturer's

Technique	Equipment Manufacturer	Conducted in Accordance With
		Specifications
Tank Interstitial Test	Tanknology or equivalent	Manufacturer's Specifications
Line Interstitial Test	Tanknology or equivalent	Manufacturer's Specifications
VPLT™ Sump Test	Tanknology or equivalent	Professional Engineer Approval
Spill & Overfill System Certification	Tanknology or equivalent	PEI RP-1200 <sup>7</sup>
Dispenser Meter Calibration	Seraphin	Weights & Measures
Dispenser Filter Change	Cimtek; PetroClear	CimTek; PetroClear
Vapor Recovery System Testing	Tanknology or equivalent	California Air Resources Board
Water Content of Headspace Vapor	RH-85 Handheld Hygrometer	Manufacturer's Specifications

Samples will be drawn prior to commencement of invasive measurements (water level, fuel temperature, etc.) that could potentially disturb the tank contents or contaminate the samples. Samples will be collected in the following order: headspace, fuel, water, and corrosion substrate. Sampling will not take place through drop tubes or riser pipes that do not allow a representative sample to be collected. Table 3 provides the sample type, location and container requirements. This table will be expanded with more information in the Site-Specific QAPP, for example, holding times and temperature/preservation requirements.

**Table 3. Sample Summary Information**

Sample Type	Tank Location	Required Containers for Analysis
Fuel	Middle	<ul style="list-style-type: none"><li>• 4 L total volume in sterile amber glass bottle(s) for chemical analysis</li><li>• Filtered fuel for biological analysis</li></ul>
Water, if any	Bottom	<ul style="list-style-type: none"><li>• 2 L sterile amber glass bottle for chemical analysis</li><li>• Filtered water for biological analysis</li></ul>
Vapor-Tedlar Bag	Headspace	<ul style="list-style-type: none"><li>• 2 L Tedlar bag for chemical analysis</li></ul>
Vapor-Sorbent Cartridge	Headspace	<ul style="list-style-type: none"><li>• 100 minute vapor sample on sorbent cartridge(s) for chemical analysis</li></ul>
Corrosive Substrate, if any	Anywhere	<ul style="list-style-type: none"><li>• Sterile plastic sample bags or conical tubes for chemical and forensics analysis</li></ul>
Failed or Affected UST Equipment Piece	Anywhere	<ul style="list-style-type: none"><li>• Sterile plastic sample bags for forensics analysis</li></ul>

## **B2 SAMPLING METHODS**

### **B2.1 Fuel and Water Samples**

The fuel and water samples undergoing chemical and microbiological analyses will be sampled following ASTM D7464-08<sup>3</sup>. This sampling method is specific to sampling for microbiological testing so the higher standard for cleanliness will be acceptable for the chemical analyses as well. Practically, aseptic sampling includes wearing sterile gloves, rinsing the sampling equipment with sterile deionized water and laboratory grade isopropyl alcohol before sampling and between sample locations. The step-by-step procedure for Core Thief Bottom Sampling is described in detail within Section 11.1.3 of the sampling method. Additionally, this method provides specific direction about the cleanliness of the sampling equipment in Sections 8-10. For the fuel samples, 4 L of fuel will be collected and homogenized by combining individual aliquots from the sampler and mixing in a sterile collection reservoir. For the water samples, a total volume of 2 L will be collected and homogenized in a similar fashion. An approximate 2-L portion of each fuel sample and about 250-milliliter (mL) portion of each water sample will be filtered through separate cellulose filters (Analytical Filter Unit, #130, Nalgene, Rochester NY). The filters will be shipped overnight on ice for analysis and the remaining liquid fuel and water samples will be placed in amber glass bottles, wrapped in bubble packaging, and shipped to the analysis laboratories on ice via ground transport. Because of the potential for microbiological growth or a shift in the microbial population distribution, the filter samples need to be received at the microbiological laboratory within 24 hours following collection.

## **B2.2 Vapor Samples**

If specified in the Project-Specific QAPP, two types of vapor samples will be collected. One type of sample will be collected in a Tedlar bag following a procedure that includes the use of a vacuum box containing an empty Tedlar bag. This method is described in the EPA Emergency Response Team standard operating procedure (SOP) #2149 for soil gas sampling<sup>8</sup>. To summarize, a vacuum pump is attached to a fitting on the vacuum box and evacuates the air in the vacuum box, creating a pressure differential causing the sample to be drawn into the bag. The sample drawn into the Tedlar bag never flows through the pump. The usual flow rate for bag sampling is three liters per minute (Lpm). Note that the bag should be filled only to 75-80% capacity.

The second type of vapor sample will be used to measure vapor phase and will be collected by pumping headspace vapor through a sorbent cartridge. Columbia Analytical Method 102 will be followed for this sampling approach. The sampling flow rate will be 1 Lpm for 100 minutes. Following sampling, the cartridge will be sealed and shipped to the analysis laboratory along with a field blank of an identical sorbent cartridge that was opened and then immediately resealed at the sample site.

## **B2.3 Corrosion Substrate Samples**

If corrosion is identified during the inspection and sampling process at a site, an attempt will be made to collect a specimen of the corrosion substrate for characterization. Corrosion substrate is expected in three types: water bottom corrosion "sludge," metallic corrosion on shafts and piping, and "nodule" substrate which is more brightly colored and composed of semi-spherical particulates. Water bottom corrosion will likely be sampled as part of the water sample and then will be transferred into a sterile bottle. Sterile scrapers and forceps will be used to loosen the metallic and nodule corrosion from metal shafts, piping, or other equipment, and then it will be transferred to a sterile plastic bag and placed on ice for shipment. The corrosion substrate does not lend itself to homogenization and the amount collected cannot be predicted. Additionally, any tank or dispenser fuel filtration media that is relevant for the case study and available for sampling will be aseptically collected by cutting a dirty portion of the filter with a sterile scissor. Then it will be placed in a sterile plastic bag and on ice for overnight shipment to the Vendor's microbiological laboratory. Care should be taken during all sterile sampling efforts to prevent contamination with human cells by wearing sterile gloves and minimize any coughing or sneezing near the samples.

### **B3 SAMPLE HANDLING AND CUSTODY**

Each sample will be handled according to ASTM D7464-08<sup>3</sup> Section 16. To summarize, all sample bottles and sorbent cartridge packages will be labeled with the case study identification, the date and time of sampling, the type of sample (fuel, water, etc.), and name of the sampling technician. Each cooler containing the samples will have a chain-of-custody (COC) form that will be completed prior to shipment. These items include unique sample identification numbers, date and time of sampling, sample description, storage condition, requested analyses; and the date, time, and by whom the samples were relinquished to the shipping company. A copy of the COC should be retained by the sampling technician. Upon receipt at the analysis laboratory, the integrity of the samples should be checked, documented, and receipt of the samples should be formally documented with a signature indicating that the samples were received. Any discrepancies or error in COC forms must be immediately reported to the TOL. Copies of all completed COCs will be provided to the Vendor TOL. More detail and forms for executing the sampling and shipment of the various samples will be included in the Site-Specific QAPP.

### **B4 ANALYTICAL METHODS**

Circumstances of the case study will dictate the analytical methods necessary to ensure a comprehensive understanding of the mode of failure.

Table 4 gives potential analytical methods that could be used when analyzing the samples from the identified case studies. This table will be revised in the Site-Specific QAPP with the specific laboratories performing the analyses and the methods needed for the case study site characteristics and circumstances. Table 4 includes the method title, standard method number (if applicable), and sample matrix according to chemical, biological, and forensic analytical laboratory methods. The standard chemical methods are very detailed and will not be reiterated in this document.

#### **B4.1 Biological Analytical Method**

##### **B4.1.1 DNA Extraction**

Frozen samples will be thawed and the entire sample collected in separate 15-mL sterile conical tubes. For solid mass samples (i.e., sediment) DNA will be extracted using the Ultraclean® Mega Soil DNA Isolation Kit (MO BIO Laboratories, Inc., Carlsbad, CA) using the manufacturer's protocol with modifications for sediment extraction. For filtered fuel and water samples, the Meta-G-Nome™ DNA

Isolation Kit (Epicentre, Madison, WI) will be used according to manufacturer's protocols for direct extraction from biomass captured on nitrocellulose filters. Post-extraction clean-up for all samples will be performed using OneStep™ PCR Inhibitor Removal Kit (Zymo Research Corp., Irvine, CA) according to manufacturer's protocol. Purified DNA samples will be quality analyzed with a UV-absorbance (NanoDrop™ 200 spectrophotometer, Thermo Scientific, Waltham, MA), Qubit® dsDNA HS Assay Kit, and SYBR® Gold Nucleic Acid Gel Stain (Invitrogen/LifeTechnologies, Grand Island, NY) according to manufacturer's protocols.

#### **B4.1.2 Sequencing**

Numerically coded aliquots of approximately 0.5 to 1 µg DNA per sample will be used to create sequencing libraries for Illumina HiSeq according to manufacturer's protocol for pair-end sequencing<sup>23</sup>. First, genomic DNA is fragmented using a Covaris™ S220 Sonicator

**Table 4. Potential Analysis Methods**

Method Title	Method Number	Sample Matrix
<i>Chemical Analyses Methods</i>		
Determination of Biodiesel (Fatty Acid Methyl Esters) Content in Diesel Fuel Oil Using Mid Infrared Spectroscopy	ASTM D7371-07 <sup>9</sup>	Fuel
Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants	ASTM D5291-10 <sup>10</sup>	Fuel and water
Electrical Conductivity of Aviation and Distillate Fuels	ASTM D2624-09 <sup>11</sup>	Fuel
Density, Relative Density, and API Gravity of Liquids by Digital Density Meter	ASTM D4052-09 <sup>12</sup>	Fuel and water
Sulfur Compounds in Light Petroleum Liquids by Gas Chromatography and Sulfur Selective Detection (hydrogen sulfide, sulfur content, sulfur speciation)	ASTM D5623-94 <sup>13</sup>	Headspace vapor
Determining Corrosive Properties of Cargoes in Petroleum Product Pipelines	NACE TM-0172 <sup>14</sup>	Fuel
Trace Nitrogen in Liquid Petroleum Hydrocarbons by Syringe/Inlet Oxidative Combustion and Chemiluminescence Detection	ASTM D5762-10 <sup>15</sup>	Fuel
Carboxylic Acids in Ambient Air Using Gas Chromatography/Mass Spectrometry	Columbia Method 102	Headspace vapor
Oxygen Concentration	Calculation	Fuel
Particulate Contamination in Middle Distillate Fuels by Laboratory Filtration	ASTM D6217-98 <sup>16</sup>	Fuel and water
Acid Number of Petroleum Products by Potentiometric Titration	ASTM D664-09a <sup>17</sup>	Fuel
pH	EPA 150.1 <sup>18</sup>	Water

Method Title	Method Number	Sample Matrix
Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence	ASTM D5453-09 <sup>19</sup>	Fuel
Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration	ASTM D6304-07 <sup>20</sup>	Fuel
<b>Biological Analyses Methods</b>		
Enumeration of Viable Bacteria and Fungi in Liquid Fuels-Filtration and Culture Procedures	ASTM D6974-09 <sup>21</sup>	Fuel, water, and corrosive substrate
Metagenomics Sequencing <sup>a</sup>	Manufacturer's Procedures	Fuel, water, and corrosive substrate
<b>Forensics Analyses Methods</b>		
Optical Microscopy/Imaging	Manufacturer's Procedures	Corroded substrate
Scanning Electron Microscopy (SEM)	Manufacturer's Procedures	Corroded substrate
Energy Dispersive Spectrometry (EDS)	Manufacturer's Procedures	Corroded substrate
X-Ray Diffraction (XRD)	Manufacturer's Procedures	Corroded substrate, corrosion product
Differential Scanning Calorimetry (DSC)	Manufacturer's Procedures	Fiberglass, polymer materials
Thermogravimetric Analysis (TGA)	Manufacturer's Procedures	Fiberglass, polymer materials
Fourier Transform Infrared Spectroscopy (FTIR)	Manufacturer's Procedures	Fiberglass, polymer materials
Raman Spectroscopy	Manufacturer's Procedures	Fiberglass, polymer materials

(a) Metagenomics sequencing is a method for identifying the repertoire of organisms in any environment/sample by analyzing the genetic information contained in the sample.

(Covaris, Inc., Woburn, MA) to approximately 300 base pairs (bp). Fragmented DNA is used to synthesize indexed sequencing libraries using the TruSeq™ DNA Sample Prep Kit V2 (Illumina, Inc., San Diego, CA). Cluster generation is performed on the cBOT using the TruSeq PE Cluster Kit v3 – cBot – HS (Illumina). Libraries are sequenced with an Illumina HiSeq 2000 at Nationwide Children's Hospital (NCH) Biomedical Genomics Core (Columbus, Ohio) using the TruSeq SBS Kit v3 reagents (Illumina) for paired-end sequencing with read lengths of 100 bps (200 cycles). Primary analysis (image analysis and basecalling) are performed using HiSeq Control Software (HCS) version 1.5.15.1 and Real Time Analysis (RTA) version 1.13.48. Secondary analysis (demultiplexing) is performed using Illumina CASAVA Software v1.6 on the NCH compute cluster. Sequence data (.fastq files) and QC reports for library construction will be delivered to the Vendor via external hard drives.

#### **B4.1.3 Organism Identification**

Bioinformatics analysis will be performed using an internally validated method similar to a previously published method<sup>23</sup>. In brief, sequence data reads are quality filtered such that 80% of the bases have quality of  $\geq 17$  (i.e., the probability of a correct base call was ~98%). Following quality filtering, read files (FASTQ) are converted to FASTA format using a custom Perl script. For each sample high quality sequence reads are analyzed using the Galileo high performance compute cluster and a custom designed, parallel implementation of the Basic Local Alignment Search Tool (BLAST®)<sup>24</sup>(National Library of Medicine, Bethesda, MD). Reads are searched against an in-house database comprised of ~1.4 million DNA genome sequences obtained from the *RefSeq* database v. 5/7/2012 (NCBI, Bethesda, MD). Top hit BLAST results are filtered for sequences with  $\geq 97\%$  identity and sequence length of  $\geq 80$  bps. Post processing filtering also includes removal of PhiX sequences (internal Illumina control) and top hits for any taxa  $< 0.01\%$  (1:10000) of the total BLAST hits. The output from this search results in a list of taxonomic IDs, associated organism names, and number of reads per taxID for each sample. Krona<sup>25</sup> v. 2.2 is used to create an interactive comparative chart for viewing the relative abundance of organisms in each sample.

#### **B4.1 Forensic Methods**

Forensic analysis of materials to elucidate root cause involves a combination of non-destructive and destructive evaluations that are sample specific. Depending on if the samples are polymeric or

metallic in nature the types of techniques used for analysis can vary. If specified in the Site-Specific QAPP, testing could be conducted on failed samples with possible comparison to pristine control specimens used to benchmark degradation and changes induced from field exposure.

In evaluation of metallic or corroded samples techniques including optical microscopy/imaging, scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), and x-ray diffraction (XRD) may be used. Both optical microscopy and SEM are useful for providing morphological and microstructure characterization and are critical for identifying modes of failures and the type of corrosion, if present. Staining, etching, and cross-sectional analysis of samples can be useful in these types of analysis. EDS provides a means of achieving elemental analysis of the samples, while XRD provides crystallographic information from both the substrates and potentially corrosion products. The composition and structure of corrosion products may be important in understanding how and how and why a failure may have occurred.

In addition to optical microscopy and SEM the forensic analysis of polymeric or fiberglass-type materials likely would involve vibrational spectroscopy techniques, including Infrared spectroscopy, Fourier transform infrared spectroscopy (FTIR), and Raman spectroscopy. These techniques provide information on the chemical structure, including that arising from chemical degradation of the sample, and can yield information on the physical structure of the material, particularly changes in the amorphous phase. During aging or wear, failure is often associated with stiffening of the amorphous phases of the material - in this case leaching or uncured components may also be of relevance. Vibrational spectroscopy techniques are one of the few methods that probes short-range length scales needed to observed organization of the amorphous phase.<sup>26</sup> Secondary confirmation with thermoanalytical techniques like differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA) can support finding from vibrational spectroscopy, as changes in physical structure often manifest in the first heating cycle due to changes in the constraint on the polymer.<sup>27</sup> These techniques provide information on variation in phase changes and melting temperatures which may be symptoms of material degradation.

## **B5      QUALITY CONTROL**

Each standard method listed in Table 4 has QC procedures/samples that are required for analysis along with the field samples to ensure the quality of the measurements. Those procedures/samples are listed in Table 5 with recommended MQOs for acceptable method performance. Where applicable, method blanks will be included to verify no cross-contamination or carry-over between samples. The Project-Specific QAPP will contain a revised table for the specific

methods needed (with detection limits and method blank criteria) depending on the case study site characteristics and circumstances.

The Vendor laboratory operations will follow Applied Biology and Aerosol Technology (ABAT) SOPs, Advanced Materials Applications (AMA) SOPs, ISO9001:2008 standards and ASTM protocols where applicable, which include processes for maintenance of laboratory records, data management, management of client property and reagents, transfer of property/materials, equipment operation and maintenance, management of controlled environments, contamination control and monitoring, as well as for specific methods such as extraction of samples from various matrices, nucleic acid analysis, and microbiological analyses. Equipment is maintained in accordance with national standards and methods as part of the quality management system, and personnel training on equipment and methods is required and documented. Subcontractors will be compliant with their internal quality management systems, including manufacturer's validated methods<sup>28</sup>. QC and QA metrics will be maintained for sample handling, processing and storage procedures. Raw data files received from the subcontractors will be analyzed quality assessed and low quality data removed using internally validated methods prior to performing analysis.

## **B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE**

The equipment needed for this project (samplers, sample containers, miscellaneous laboratory items, etc.) will be tested, inspected, maintained and operated according to the quality requirements and documentation of any applicable standard method or of the laboratory responsible for its use to ensure confidence in data that they generate. Testing and maintenance must be performed according to manufacturer instructions and analytical methods and documented. Only properly functioning equipment will be used; any observed malfunctioning will be documented and appropriate maintenance or replacement of malfunctioning equipment will be performed.

**Table 5. Measurement Quality Objectives for Potential Analysis Methods**

Method Title	Method Designation	QC Procedures	Recommended MQOs
<i>Chemical Analyses Methods</i>			
Determination of Biodiesel (Fatty Acid Methyl Esters) Content in Diesel Fuel Oil Using Near Infrared Spectroscopy	ASTM D7371-07 <sup>9</sup>	Daily QC check sample similar in composition to samples	Determination of QC limits in progress
Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants	ASTM D5291-10 <sup>10</sup>	Daily QC check sample similar in composition to samples	EDTA check standard: C: 42.6 % $\pm$ 1.6 H: 5.56 % $\pm$ 0.55 N: 9.57 % $\pm$ 1.01 Precision: C: $\pm$ 0.15 % H: $\pm$ 0.03 % N: $\pm$ 0.1 %
Electrical Conductivity of Aviation and Distillate Fuels	ASTM D2624-09 <sup>11</sup>	daily instrument check of metal probe	Internal check of metal probe conductivity <1% error
Density, Relative Density, and API Gravity of Liquids by Digital Density Meter	ASTM D4052-09 <sup>12</sup>	Daily QC check sample similar in composition to samples	Accuracy: 0.8433g/mL $\pm$ 0.0004 Precision: $\pm$ 0.0002
Sulfur Compounds in Light Petroleum Liquids by Gas Chromatography and Sulfur Selective Detection (hydrogen sulfide, sulfur content, sulfur speciation)	Modified ASTM D5623-94 <sup>13</sup>	Daily QC check sample and solvent blank	Accuracy within 0.2 ppm

**Table5. Measurement Quality Objectives for Potential Analysis Methods (Continued)**

Method Title	Method Designation	QC Procedures	Recommended MQOs
Determining Corrosive Properties of Cargoes in Petroleum Product Pipelines	NACE TM-0172 <sup>14</sup>	None required	None required
Trace Nitrogen in Liquid Petroleum Hydrocarbons by Syringe/Inlet Oxidative Combustion and Chemiluminescence Detection	ASTM D5762-10 <sup>15</sup>	Daily QC check sample of known nitrogen content	Accuracy and precision: 15 ppm $\pm$ 0.5
Carboxylic Acids in Ambient Air Using Gas Chromatography/Mass Spectrometry	Columbia Method 102	Daily QC check sample and solvent blank	Within control limits of routine QC check sample analyses <sup>18</sup>
Particulate Contamination in Middle Distillate Fuels by Laboratory Filtration	ASTM D6217-98 <sup>16</sup>	Duplicate samples	Duplicate less than 10% different
Acid Number of Petroleum Products by Potentiometric Titration	ASTM D664-09a <sup>17</sup>	Daily QC check sample similar in composition to samples	0.0039mg KOH/L $\pm$ 0.0005
pH	EPA 150.1 <sup>18</sup>	Daily calibration curve and continuing QC check samples	Second-source buffers that must be $\pm$ 0.05 pH units
Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence	ASTM D5453-09 <sup>19</sup>	Daily calibration curve and QC check sample similar in composition to samples	Accuracy: 8.75 $\pm$ 0.5 ppm. Precision: $\pm$ 0.2 ppm
Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration	ASTM D6304-07 <sup>20</sup>	Daily QC check sample similar in composition to samples	Two QCs used. 163 ppm $\pm$ 46 and 337 $\pm$ 57. Precision: $\pm$ 30 at lower concentration and $\pm$ 14 at higher

**Table5. Measurement Quality Objectives for Potential Analysis Methods (Continued)**

Method Title	Method Designation	QC Procedures	Recommended MQOs
<i>Biological Analyses Methods</i>			
Enumeration of Viable Bacteria and Fungi in Liquid Fuels-Filtration and Culture Procedures and	ASTM D6974-09 <sup>21</sup>	Qualitative analysis	None required
Metagenomics Sequencing	Manufacturer's Procedures	Qualitative analysis	None required
<i>Forensics Analyses Methods</i>			
Optical Microscopy	Manufacturer's Procedures	Calibration micrometer	500 ± 10µm and 10 ± 0.2 µm
Scanning Electron Microscopy (SEM)	Manufacturer's Procedures	NIST calibration standard	± 10% of factory set conditions
Energy Dispersive Spectroscopy (EDS)	Manufacturer's Procedures	QC check of known Al and Cu standards	Al 1.487 ± 0.1 keV Cu 8.047 ± 0.1 keV
X-Ray Diffraction (XRD)	Manufacturer's Procedures	QC check of known Si standard	Difference of 2 Theta positions (expected to observed) values <0.1 2Theta
Differential Scanning Calorimetry (DSC)	Manufacturer's Procedures	QC check of known In standard	1% of onset
Thermogravimetric Analysis (TGA)	Manufacturer's Procedures	QC check of alumel	1% of onset
Fourier Transform Infrared Spectroscopy (FTIR)	Manufacturer's Procedures	Run 100% line, polystyrene film	None required
Raman Spectroscopy	Manufacturer's Procedures	QC check of known Si standard	Calibrated within 1 wave number

**B7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY**

The instruments and equipment used for this study must be calibrated prior to use to ensure that the data generated are accurate. Calibration must be performed according to manufacturer

**Table5. Measurement Quality Objectives for Potential Analysis Methods (Continued)**

instructions and the analytical methods. Some of the methods used during this project require calibration each day of analysis, but some require only a QC check sample to be analyzed to confirm the ongoing accuracy of calibration that is performed periodically (or possibly only by the manufacturer). Instrument and equipment calibration activities must be documented by model and serial number so that activities are traceable to the specific unit. Each organization must have documented procedures for equipment and instrument calibration that includes a description of calibration standards, initial calibration, calibration verification, frequency, and acceptance criteria.

Table 6 gives the calibration frequency required for each potential method. The acceptance criteria for specific methods used will be given in the Site-Specific QAPP.

**Table 6. Frequency of Instrument Calibration**

Method Title	Method Designation	Instrument Make/Model	Frequency of Instrument Calibration
<i>Chemical Analyses Methods</i>			
Determination of Biodiesel (Fatty Acid Methyl Esters) Content in Diesel Fuel Oil Using Mid Infrared Spectroscopy	ASTM D7371-07 <sup>9</sup>	NIRSystems	Initial calibration, recalibration upon failure of check standard
Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants	ASTM D5291-10 <sup>10</sup>	Leco TruSpec CHN	Initial calibration with each batch, ongoing calibration standards throughout analysis
Electrical Conductivity of Aviation and Distillate Fuels	ASTM D2624-09 <sup>11</sup>	Emcee Electronics Model 1152	Instrument zeroed with each day's use to ensure proper operation
Density, Relative Density, and API Gravity of Liquids by Digital Density Meter	ASTM D4052-09 <sup>12</sup>	Anton Paar DMA4500M	Initial calibration with weekly QC check to verify proper operation
Sulfur Compounds in Light Petroleum Liquids by Gas Chromatography and Sulfur Selective Detection (hydrogen sulfide, sulfur content, sulfur	Modified ASTM D5623-94 <sup>13</sup>	Agilent 7890 GC with Sievers 355 sulfur Chemiluminescence detector	Initial single point calibration to set response factors

**Table 6. Frequency of Instrument Calibration (Continued)**

Method Title	Method Designation	Instrument Make/Model	Frequency of Instrument Calibration
speciation)			
Determining Corrosive Properties of Cargoes in Petroleum Product Pipelines	NACE TM-0172 <sup>14</sup>	Kohler Instrument Corporation	Qualitative analysis; no calibration needed
Trace Nitrogen in Liquid Petroleum Hydrocarbons by Syringe/Inlet Oxidative Combustion and Chemiluminescence Detection	ASTM D5762-10 <sup>15</sup>	Antek 9000HSN	Initial calibration with calibration check standard analyzed every day of use
Carboxylic Acids in Ambient Air Using Gas Chromatography/Mass Spectrometry	Columbia Method 102	Agilent 6890GC/5973MS	Initial 5 point calibration curve with calibration check standard analyzed every day of use
Particulate Contamination in Middle Distillate Fuels by Laboratory Filtration	ASTM D6217-98 <sup>16</sup>	Mettler-Toledo	Manufacturer balance calibration and daily accuracy check with mass standards
Acid Number of Petroleum Products by Potentiometric Titration	ASTM D3242 <sup>17</sup>	None required	No calibration required for titration
pH	EPA 150.1 <sup>18</sup>	Orion 290A	3 point calibration curve each day of use
Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence	ASTM D5453-09 <sup>19</sup>	Antek 9000VLS	Initial calibration with daily calibration check standard to verify calibration
Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration	ASTM D6304-07 <sup>20</sup>	Metrohm 831 KF coulometer	Coulometer check with fresh reagent after every ten samples
<b>Biological Analyses Methods</b>			
Enumeration of Viable Bacteria and Fungi in Liquid Fuels-Filtration and	ASTM D6974-	Ion Torrent	No calibration required,

**Table 6. Frequency of Instrument Calibration (Continued)**

Method Title	Method Designation	Instrument Make/Model	Frequency of Instrument Calibration
Culture Procedures	09 <sup>21</sup>		biological culture
Metagenomics Sequencing	Metagenomics Sequencing	Illumina HiSeq2000	No calibration
<b>Forensics Analyses Methods</b>			
Optical Microscopy	Manufacturer Procedure	Macro-Olympus SZX-12, Micro-Olympus BX-51	Before imaging session
Scanning Electron Microscopy	Manufacturer Procedure	JEOL 7600F FEG-SEM	Monthly
Energy Dispersive Spectroscopy (EDS)	Manufacturer Procedure	EDAX Trident System	Weekly
X-Ray Diffraction	Manufacturer Procedure	Rigaku Ultima IV Wide Angle X-Ray Powder Diffractometer (XRD)	Monthly
Differential Scanning Calorimetry (DSC)	Manufacturer Procedure	Perkin Elmer Diamond DSC	Before analysis
Thermogravimetric Analysis (TGA)	Manufacturer Procedure	Perkin Elmer Pyris 1	Before analysis
Fourier Transform Infrared Spectroscopy (FTIR)	Manufacturer Procedure	Digilab FTS-60A, Digilab FTS-7000e	Monthly
Raman Spectroscopy	Manufacturer Procedure	Horiba JY "Aramis" System	Daily

## **B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES**

All materials, supplies, and consumables to be used during this project will be ordered by the TOL or designee. Unless specifically noted, all other supplies required for the evaluation are expected to be standard laboratory supplies (e.g., beakers, racks, etc.) that will not be required to meet a customized set of specifications. Supplies and consumables will be inspected and tested prior to use to ensure that they conform to the required level of quality. The laboratory managers and site inspection leader are responsible for ensuring that supplies meet the following standards:

- Containers for analytical chemistry samples must be free of defects (chips, cracks, etc.). Prior to use in the field, the containers will be inspected. Any defective material will be replaced before the sampling event begins.
- Containers and lids used in the field must be of the right type (e.g., glass, high-density polyethylene Teflon®-lined) without flaws (cracks, chips, tears).
- Certified clean containers (I-Chem or equivalent) will be used as sample containers in the field.
- Reagents and chemicals must be pesticide grade or better, with percent purity of at least 96%.
- Standards used to calibrate equipment must be within expiration date, have an assigned lot number and purity, and be continuously stored to maintain integrity. When possible, National Institute of Standards and Technology (NIST) traceable materials will be used for preparation of calibration standards and check standards.

## **B9 NON-DIRECT MEASUREMENTS**

Any secondary data required for this project will be collected from the case study site owners and operators and will be assumed to be accurate upon data gathering. Such information may include tank volume, throughput, additive information, etc.

## **B10 DATA MANAGEMENT**

All project staff will acquire and record data electronically or manually as described in Section A7. All handwritten entries will be recorded in ink, and corrections to the entry will be made with a single line so as to not obliterate the original entry; the corrections will be initialed and dated. An

explanation will accompany all non-obvious corrections. Records received by or generated by any of the project staff during the project will be reviewed by the TOL or designee within two weeks of receipt or generation before the records are used to calculate, evaluate, or report results. The person performing the review will add his/her initials and date to the hard copy of the record being reviewed. In addition, all calculations, especially statistical calculations performed by project staff, will be spot-checked by the TOL or designee to ensure that calculations are performed correctly.

All spreadsheets and word processing documents applicable to this project will be stored on the Vendor network server, which is backed up daily. All electronic and hardcopy data records for this project will be retained for at least 10 years after the final report submission. The final report is maintained for 20 years. At the end of the storage period, these records will be destroyed using secure procedures (shredding or deletion).

## **Section C: ASSESSMENT AND OVERSIGHT**

### **C1 ASSESSMENTS AND RESPONSE ACTIONS**

Internal QC measures (e.g., QC check samples, regular review of raw data, spot-checking of calculations, etc.) described in this QAPP, implemented by the project staff and monitored by the TOL, will give information on data quality on a day-to-day basis. The responsibility for interpreting the results of these checks and resolving any potential problems resides with the TOL. Project staff has the responsibility to identify problems that could affect data quality or the ability to use the data. Any problems that are identified will be reported to the TOL, who will work to resolve any issues. Action will be taken to control the problem, identify a solution to the problem, and minimize losses and correct data, where possible. The Vendor will be responsible for ensuring that the following audit is conducted as part of this project.

#### **C1.1 Data Quality Audit**

The Vendor QA Officer will audit at least 10% of the data acquired during the project. The Vendor QA Officer will trace the data from lab reports, through reduction, to final reporting. All calculations performed on the data undergoing the audit will be checked. The Vendor QA Officer will prepare an audit report describing the results of the data quality audit.

### **C2 REPORTS TO MANAGEMENT**

The data quality audit will be documented in assessment reports and will include:

- Identification of any adverse findings or potential problems;
- Response to adverse findings or potential problems;
- Recommendations for resolving problem;
- Confirmation that solutions have been implemented and are effective; and
- Citation of any noteworthy practices that may be of use to others.

During the course of any assessment or audit, Vendor's QA Officer will identify to the technical staff performing experimental activities any immediate corrective action that should be taken. If serious quality problems exist, Vendor's QA Officer will contact the STREAMS II Contract Manager to request a stop work order. Once the assessment report has been prepared, Vendor's TOL will ensure that a response is provided for each adverse finding or potential problem and will implement any necessary

follow-up corrective action. Vendor's QA Officer will ensure that follow-up corrective action has been taken.

## **Section D: DATA VALIDATION AND USABILITY**

### **D1 DATA REVIEW, VERIFICATION, AND VALIDATION**

Data verification and validation procedures are used throughout the data collection, analysis, and reporting process to assess data quality. Field sampling data are verified through the chain-of-custody process that compares field IDs to sample bottle labels. Sampling documentation is verified through the review and approval of each survey log book by the field manager. Data verification is also accomplished by ensuring the accuracy and completeness of data transcribed from raw data to the results report. A comparison of raw data sheets, field logs or LRB comments against final data will be conducted to flag any suspect data and resolve any questions about apparent outliers. Entry of data into spreadsheets from field logs and laboratory reports is verified when the QA Officer audits the data.

Laboratory data are verified through internal audits of calibration, analysis, and sample results. The results of these audits are documented as data flags and in QA Statements or QC narratives that are submitted with each data set. Each laboratory is responsible for the quality of their data. At a minimum, the following verification requirements must be incorporated into laboratory data reviews.

- Any data that are hand-entered (i.e., typed) are verified by qualified personnel prior to use in calculations or entry into the database.
  - All manual calculations are performed by a second staff member to verify that calculations are accurate and appropriate.
  - Calculations performed by software are verified at a frequency sufficient to ensure that the formulas are correct, appropriate, and consistent, and that calculations are accurately reported.
- All modifications to data reduction algorithms are verified prior to submission of data.

Where applicable, data validity and usability will be assessed through review of QC check samples to assess accuracy and precision. Data validation is performed by reviewing holding times, and QC check sample results. The criteria for these data quality requirements are presented in Table 5. The acceptance criteria for the QC objectives generally rely on the generation of routine QC check sample performance data. The quality assessment, as described within Section C of this document, is designed to ensure the quality of these data.

## **D2     VALIDATION AND VERIFICATION METHODS**

Data verification includes a visual inspection of hand written data to ensure that all entries were properly recorded and that any erroneous entries were properly noted, as described in Sections B10 and D1. Data validation efforts include the assessment of QC data and the performance of a data quality audit (Section C) to determine if the data collection and measurement procedures met the quality objectives defined in the QAPP. The Vendor QA Officer will conduct an audit of data quality to verify that data review and validation procedures were completed, and to ensure the overall quality of the data.

## **D3     RECONCILIATION WITH USER REQUIREMENTS**

Once data have been generated and compiled in the laboratory, the TOL will review data to identify and make professional judgments about any suspicious values. All suspect data are reported with a qualifier and appropriate comment. These data may not be used in calculations or data summaries without the review and approval of the TOL. No data measurements are eliminated from the reported data or database and data gaps are never filled based on other existing data. If samples are lost during shipment or analysis, it is documented in the data qualifiers and comments submitted to EPA. The data obtained during this project will provide thorough documentation of the required measurements. The data review and validation procedures described in the previous sections will determine if data meet the quality objectives. The data generated throughout this project will be compiled into a results report. The results report will present tables of the measured data and resulting data describing the results of the site inspections and required measurements. Any limitations to the data will be addressed and discussed in the results report.

## Section E: REFERENCES

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**APPENDIX A**  
**Packing and Shipping Plan**

## **PACKAGING AND SHIPPING PLAN**

### **1.0 OBJECTIVE**

The purpose of this plan is to define the procedures, responsibilities, and documentation associated with the packaging and shipping of samples.

### **2.0 RESPONSIBILITIES**

The sample custodian or designee is responsible for the proper packaging and shipping of samples from the case study site. The project manager or designee is responsible for contacting the recipient of the material to be shipped to notify them of a pending delivery.

### **3.0 EQUIPMENT**

#### **Field Pack Equipment**

Coolers

Bubble Wrap

Teflon Tape

Black Ball Point Pens (for COC forms)

Permanent, black magic markers (for samples jars and labels only)

Blank Custody Forms

Proper Jars for sampling

Packaging Tape

Chain-of-custody (COC) Seals

### **Sample Transmittal Equipment**

Coolers

Bubble Wrap

Sample Transmittal Forms (COC's)

Samples

Cover Letter

Zip Lock Bag

## **4.0 PREPARTION**

### **4.1 Cooler Preparation**

Coolers should have a sturdy handle, a working top, and be in good shape. Do not use damaged or potentially contaminated coolers.

### **4.2 Cooler Labeling**

It is critical that all coolers are labeled accurately and securely to ensure that samples are not lost. The shipping label (typically FedEx) should be permanently attached to the FedEx tag on the cooler handle. In order to ensure that the label doesn't fall off, attach a plastic tie.

## **5.0 PROCEDURE**

There are two types of shipping performed by the sample custodian or designee. The most common is Sample Transmittal or sample transfer, this occurs when the field staff ships samples to an analysis laboratory. The second type of shipping is the preparation and shipment of "Field Packs."

### **5.1 Shipping Samples**

The sample custodian or designee packs the samples securely in a cooler with bubble wrap and adds blue ice or crushed ice to achieve the proper temperature and to ensure that the samples stay at a

constant temperature for their entire trip. The cooler should have at least one inch of bubble wrap placed on the bottom of the cooler and the samples should be wrapped in bubble wrap if breakable or crushable containers are used. Cubitainers are soft plastic and are easily punctured. Cubitainers should not be packaged with anything that has sharp edges. The samples must be packed tightly and not be able to move freely in the cooler; they must be secure. An upper weight limit of 70 pounds per cooler is suggested. All paper work is signed, the original custody forms are placed in a zip lock bag with instructions for the analysis laboratory, and taped to the inside cover of the cooler to avoid moisture damage.

The instructions accompanying samples should include:

- the name of the Vendor's technical contact;
- a statement about the number of coolers being shipped;
- a description of the work to be performed or a reference to the appropriate document (e.g., contract, QAPP); and
- a request that the receiving laboratory return the signed custody forms.

When one sample shipment is contained in multiple coolers, the individual coolers should be numbered 1 of 3, 2 of 3, etc. In addition, the Federal Express (or other transporter) label should be completed to indicate the cooler number and total number of coolers in the shipment (1 of 3, 2 of 3, etc.). Each cooler shipped by Federal Express receives a unique tracking number, tracking numbers will be documented in the project records for each cooler.

Shipping over national holidays and for Saturday delivery should be avoided whenever possible.

## **5.2 Shipping Field Packs**

The second form of shipping is a "field pack." In this type of shipping the empty jars and coolers are sent to point of contact (POC) for sampling at a case study site. They might consist of just an empty cooler or include a complete kit of sampling jars, pens, packing tape, bubble wrap, custody forms and warm blue ice to be frozen in the field. This type of packaging needs to be secured in the same manner as actual samples (described above). Field packs must be accompanied by Attachment 1, which describes sampling and documentation requirements for field personnel to ensure the integrity of the samples.

If the sample jars are shipped from the Vendor, the certificate which comes with the jars certifying that they are precleaned will be kept in the shipping box. This documentation will be returned to the

laboratory with the samples and custody forms and stored with the shipment information . The custodian notes the jar lot number(s) on the sample custody forms that are shipped to the client. If the sample jars are drop-shipped directly to the field then the Vendor is not responsible for retaining the jar certificates unless they are shipped to the Vendor with the samples.

## **ATTACHMENT 2**

### **Instructions for Field Sampling**

#### **RESPONSIBILITIES**

The person collecting the samples (sample collector) is responsible for:

- Collect and preserve samples in accordance with approved procedures, as specified in the Project-Specific QAPP.
- Collect sufficient sample for the intended analyses.
- Assign a sample number or code at the time of collection that uniquely identifies that sample.
- Label each sample container with the sample number, project identification, date of collection, collector's initials, and storage requirements (room temperature, frozen, chilled). Labeling system must be water resistant and use indelible ink. Sharpies cannot be used for VOA samples.
- Document sample collection (location, date and time of collection, collector's name), sample type (matrix), preservation, and any special remarks on the custody form.
- Collect samples into proper sample containers (see table below).
- Package samples for shipment in a manner that minimizes the risk of breaks and leaks and to ensure that the samples are maintained at the appropriate temperature.
- Complete and sign the custody form completely, accurately, and legibly.
- Enclose the custody form in a sealed plastic bag, and attach the bag to the inner top of the cooler.
- Ensure integrity of the samples by sealing or locking the shipping container(s) and applying custody tape (if required).
- Arrange timely transportation of samples to the laboratory; identify on the shipping label the name of the person to whom the samples should be delivered.
- Ship samples with ample time to meet holding time requirements and ample volume for the intended analyses.
- Call the receiving laboratory to notify them that the samples have been shipped and when they are expected to arrive.

If the samples show signs of damage or contamination, contact the project manager immediately to determine if samples should be re-collected. Compromised samples must be segregated and shipped separately to avoid potential cross-contamination.

#### **SHIPPING REQUIREMENTS**

It is the Vendor's policy that samples are not received outside of regular business hours unless the project manager has made specific arrangements with the laboratory manager and the sample custodian in advance. Large quantities of hazardous fuel will not be collected during the case study inspections. It is anticipated that liquid samples that will be sent overnight by air will be filtered and not hazardous. When shipping the liquids, what is necessary is dependent on the type of fuel and the anticipated mode of failure. Diesel (UN 1202) and ethanol solutions (UN 1170) are both Class 3 flammable liquids. The Material Safety Data Sheets (MSDS) specify the placarding requirements in the Transportation Information section.

## REJECTION OF SAMPLES

It may be necessary for the Vendor to reject samples if any of the following conditions are noted upon receipt:

- The integrity of the samples is compromised (leaks, cracks, grossly contaminated container exteriors or shipping cooler interiors, obvious odors, etc.).
- The identity of the container cannot be verified.
- The proper preservation of the container cannot be established.
- Incomplete sample custody forms: the sample collector or the intended analysis is not documented, or the custody forms are not signed and dated by the person who relinquished the samples.

## HOLDING TIMES AND CONDITIONS

The employer of the field sampling team is responsible for determining, documenting, and communicating to the field sampling team the holding times required for the intended analysis. In the absence of other instructions, the attached criteria should be applied.

Sample Matrix	Containers (Volume)	Preservation		Holding Time To Analysis	Transport by Ground or Air
		Temperature	Other		
Filtered Fuel and Water Bottoms	0.45 µm Filters	Cool <6°C	None	24 hours to lab, 1 year at -80°C freezer	Air Overnight
Fuel	1 or 2 L Amber Glass Jars with Teflon lined caps	Cool <6°C	None	14 days	Ground
Water Bottom	1 or 2 L Amber Glass Jars with Teflon lined caps	Cool <6°C <sup>1</sup>	None	14 days	Ground
Vapor	3 L Tedlar Bag or Sorbent Cartridge	Ambient	None	14 days	Ground
Bottom Sediment	100 mL Glass Jar or 50 mL Conical Tube	Cool <6°C <sup>1</sup>	None	90 days	Ground

Sample Matrix	Containers (Volume)	Preservation		Holding Time To Analysis	Transport by Ground or Air
		Temperature	Other		
<b>Corrosion Substrate or Equipment Piece</b>	Sterile plastic sampling bag or conical tubes	Ambient	None	6 months	Ground

1 – Samples stored cool should be above freezing (0°C).

## **ATTACHMENT 2**

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- Document sample collection (location, date and time of collection, collector's name), sample type (matrix), preservation, and any special remarks on the custody form.
- Collect samples into proper sample containers (see table below).
- Package samples for shipment in a manner that minimizes the risk of breaks and leaks and to ensure that the samples are maintained at the appropriate temperature.
- Complete and sign the custody form completely, accurately, and legibly.
- Enclose the custody form in a sealed plastic bag, and attach the bag to the inner top of the cooler.
- Ensure integrity of the samples by sealing or locking the shipping container(s) and applying custody tape (if required).
- Arrange timely transportation of samples to the laboratory; identify on the shipping label the name of the person to whom the samples should be delivered.
- Ship samples with ample time to meet holding time requirements and ample volume for the intended analyses.
- Call the receiving laboratory to notify them that the samples have been shipped and when they are expected to arrive.

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Vapor	3 L Tedlar Bag or Sorbent Cartridge	Ambient	None	14 days	Ground
Bottom Sediment	100 mL Glass Jar or 50 mL Conical Tube	Cool <6°C <sup>1</sup>	None	90 days	Ground

Sample Matrix	Containers (Volume)	Preservation		Holding Time To Analysis	Transport by Ground or Air
		Temperature	Other		
<b>Corrosion Substrate or Equipment Piece</b>	Sterile plastic sampling bag or conical tubes	Ambient	None	6 months	Ground

1 – Samples stored cool should be above freezing (0°C).

**SURVEILLANCE PLAN  
STREAMS II  
Task Order 0016, Battelle EP-C-11-038**

**TITLE:** Failure Analyses of Underground Storage Tank Equipment in Biofuels Service II

**TOCOR:** Patricia Schwenke

Performance Objective (Task)	Activities	Deliverables	Date(s) of Delivery	Acceptable Criteria	Contractor Incentive (CI)	<u>✓</u> or <u>X</u>
<b>Task 1:</b> Exploratory Pre- investigation	<p>Upon receipt of an order from EPA, perform the pre-investigation at the site including the following activities:</p> <ul style="list-style-type: none"> <li>- a visualization of the in-tank circumstances using a video recorder</li> <li>- gaining clarification and/or more details to the site circumstances (i.e., automatic tank gauging records, maintenance records, and general information)</li> <li>- depending on whether fuel is available for sampling, the technician will also collect the necessary liquid samples and ship them to the contractor's laboratory</li> <li>- Store the samples appropriately for chemical and biological analyses. If the site is designated as a case study,</li> </ul>	A pre-investigation memo that accompanies the in-tank video DVD	Two (2) weeks after the pre-investigation	<p>The pre-investigation memo summarizes the findings of the activities</p> <p>The in-tank video DVD is in good quality</p> <p>Use of selective images from the DVD, when necessary, to support the recommendation to aid EPA in making decisions about naming the site for in-depth failure analyses.</p>	TOCOR will address compliance in PPE	X

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	these samples will be analyzed according to the site-specific QACC.					
<b>Task 2:</b> Site-Specific Quality Assurance Project Plan (QAPP)	<p>The QAPP shall include consideration of the analyses of the fuel, vapor and water samples shipped from the site for chemical and/or microbiological analyses which are deemed necessary.</p> <p>The QAPP shall also include consideration of the structural and mechanical measurements of the failed part samples shipped from case studies, using internationally-recognized sampling and testing protocols, in order to determine the root cause of equipment failure.</p> <p>Once EPA becomes aware of an UST site appropriate for this project, the EPA TOCOR will provide more specific information to the awardee. The awardee will then have 5</p>	<p>A general QAPP for the task order</p> <p>The general shipping plan</p> <p>A project-specific QAPP, once an appropriate site has been identified.</p>	<p>General QAPP has been approved by EPA on 9/14/2012</p> <p>Approved on 9/14/2012</p> <p>The site specific-QAPP must be delivered for EPA review and approval at least 5 days prior to the collection of samples or, at a date negotiated and directed by EPA.</p>	<p>List of standards and/or protocols is adequate;</p> <p>The plan is adequate and meets DOT requirements for shipping hazardous materials.</p> <p>Project-specific QAPP clearly identifies what information will be sought, and what analysis will be performed in order to determine the root cause of equipment failure.</p>	TOCOR will address compliance in PPE	X

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	days to deliver to EPA a project-specific QAPP, using elements described in the general QAPP described above.					
<b>Task 3: Information Gathering</b>	<p>Upon receipt of a tank failure notification, work to gather information on the following:</p> <ul style="list-style-type: none"> <li>- Date and time of incident</li> <li>- Location of incident (state and city);</li> <li>- Map showing the UST facility, location of failure or failed components;</li> <li>- Tank and piping information</li> <li>- Information on repairs or upgrade</li> <li>- Fuel stored</li> <li>- Bill of lading or drop ticket, inventory control records if available</li> <li>- Failed UST component</li> <li>- Failure mode, and other relevant details about the equipment;</li> <li>- Whether any product was</li> </ul>	Summary of findings, as part of forensic report	Final results provided in the forensic report.	<p>Reasonable effort made to collect all information and justification for not obtaining data;</p> <p>Summary of information collected is clear, concise, and presented in an understandable way;</p> <p>Documents, maps, data and photographs provided as specified in the deliverables.</p>	TOCOR will address compliance in PPE	X
		List of people contacted, as an appendix to forensic report	Final results provided in the forensic report.		TOCOR will address compliance in PPE	X
		Detailed map of the UST facility, etc.	Final results provided in the forensic report.		TOCOR will address compliance in PPE	X
		Photographs, DVDs	Final results provided in the forensic report.		TOCOR will address compliance in PPE	X
		Data or copies of documents	Final results provided in the forensic report.		TOCOR will address compliance in PPE	X

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	<p>released to the environment</p> <ul style="list-style-type: none"> <li>- Relevant photographs</li> <li>- Any other information relevant to the site, equipment, or failure mode.</li> </ul>					
<b>Task4: Obtaining Samples</b>	<p>Prepare the sampling kits for the collection of biofuel, vapor and water samples for the tests deem necessary ,</p> <ul style="list-style-type: none"> <li>- Chemical tests of biofuels, vapor and associated water in contact with the fuel</li> <li>- Microbiological analysis of biofuels, vapor and associated water</li> </ul> <p>Prepared and provide instructions to the site for the sample collection of biofuel, vapor and associated water.</p> <p>Prepare and provide instructions to the site for the sample collection of the failed UST equipment.</p>	<p>List of standards and/or protocols used for sample collection and shipping are in a QAPP and in the appendix to the forensic report</p>	<p>Partial results provided in the monthly progress report.</p> <p>Final results provided in the forensic report.</p>	<p>List of standards and/or protocols is accurate and complete</p> <p>Evidence showing the shipping plan is being followed.</p>	<p>TOCOR will address compliance in PPE</p>	<p>X</p>
		<p>Shipping plan for the categories of samples listed in ASTM E2733.</p>	<p>Partial results provided in the monthly progress report.</p> <p>Final results provided in the forensic report.</p>		<p>TOCOR will address compliance in PPE</p>	<p>X</p>

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	Coordinate the shipping of all the samples collected at the site to its laboratory.					
<b>Task 5: Sample Analyses</b>	Analyze the biofuel, vapor and water samples shipped from the site for chemical and/or microbiological analyses which are deemed necessary.	List of standards and/or protocols used for sample analysis, provided in the appendix to the forensic report	Partial results provided in the monthly progress report.  Final results provided in the forensic report.	List of standards and/or protocols is accurate and complete.  Test data, tables, charts, and/or graphs, are timely provided in monthly progress report and in an appendix to the forensic report.	TOCOR will address compliance in PPE	X
	Analyze the samples shipped from case studies of failures, using internationally-recognized sampling and testing protocols, in order to determine the root cause of equipment failure	Test data, tables, charts, and/or graphs, provided in an appendix to the forensic report	Partial results provided in the monthly progress report.  Final results provided in the forensic report.		TOCOR will address compliance in PPE	X

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<b>Task 6: Report Requirements</b>	Prepare Monthly Technical Progress Report	Monthly Technical Progress Report	Reports are due by the tenth day of each month	Timely submission with required information included	TOCOR will address compliance in PPE	X
	Prepare Monthly Financial Progress Report	Monthly Financial Progress Report	Reports are due by the tenth day of each month	Timely submission with required information included	TOCOR will address compliance in PPE	X
	Prepare a draft report for each case study for EPA feedbacks which includes: - Summarizes the findings from the site, - Describes in detail the UST equipment failure, - Outlines all testing performed, - Discusses data and based on data given, - Suggests the probable mode of failure for the UST component, and - Provides photographs that	A draft report for each case study	Within 12 weeks of initial contact with tank owner.	Report is organized, adequate, well written, and delivered with 12 weeks of initial contact with tank owner.	TOCOR will address compliance in PPE	X
		A final report in MS Word format for each case study	Within 14 days upon the receipt of EPA's feedback on the draft report.	Feedback from EPA has been addressed and is incorporated in the final report.	TOCOR will address compliance in PPE	X

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	illustrate the component failure.  Prepare a final report			Report is organized, complete, well written, free of grammatical and typographical errors, and delivered within 14 days upon the receipt of EPA's feedback on the draft report.	TOCOR will address compliance in PPE	X
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